RAILROAD GAZETTE

FRIDAY, NOV. 6.

CONTENTS.

Contributions.

Reconnaissances in South America.

Ferro-Carril Central del Peru,
CHICLA, Oct. 1, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Sept. 4 I notice an article on "Reconnaissances in South America" that is rather inaccurate.

The association has two parties of engineers making surveys on the River Desaguadero for the purpose of devising a scheme for improving the navigation of that river. It is on the western side of the main range of the Andes, and is nearly all in Bolivia. It flows from Lake Titicaca into Lake Pansa, and there sinks. These lakes and their connecting river form a separate system, and have no connection with any other rivers, nor can have. It would be as easy to connect Salt Lake with Green River by a water route as it would be to connect the Desaguadero with the Amazon.

The river has a light fall, and spreads out in various shallow channels; small steamers have been running there for a number of years. But the prospects now are that a large mining development will take place near Oruro, and the design is to bring the ores to Puno, on Lake Titicaca, and ship them by the railroad to Mollendo, instead of allowing them to go to Antofgaasta.

A survey was made about 18 years ago from Puno along the south side of Lake Titicaca to the Desaguadero. Small steamers run from Puno across the lake to the Bolivian side. From there to La Paz, about 70 miles, there is a good stage road, and an easy route for a railroad.

Here we are getting along well, have over 2,000 men at work, and will probably be at the summit by the end of the year, if not delayed by putting up bridges.

JAMES R. MAXWELL.

[In our issue of Sept. 11 will be found a letter from a Peruvian traveler making the same correction, but Mr. Maxwell gives further information.—EDITOR RAILROAD GAZETTE.]

The Johnstone Compound Trials.

CITY OF MEXICO, Oct. 21, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest an article in your issue of Sept. 25., by A. R, of La Paz, in which he analyzes the trials made by me with a compound and simple engine; and as A. R uses a different method from myself in arriving at the amount of work done by the two engines it is gratifying to see how nearly the results coincide.

A. R. asks what is the exact value of the unit of work as assumed by me in the calculation. I thought I had made clear the method adopted in reducing the line to an equivalent of a straight and level track, but I fear that my wording of the statement has led A. R. to believe I had eliminated all that portion of the line on curves. Perhaps I should have been better understood had I said "curves being compensated, the resistance due to curvature was left out of the calculation and the curved portion considered as tangents on the same grades." I am justified in making this assumption, as I have repeatedly watched the performance of engines hauling freight trains up these mountains and find that the resistance of the train is practically the same on these compensated curves as on the tangents.

For further information as to the methods employed in arriving at the units of work performed and of reducing the various grades to an equivalent straight and level track I would refer A. R. to an article upon this subject in the *Railroad Gazette* of August 21, 1891.

A. R. considers a coefficient of adhesion of less than $\frac{1}{5}$ as low, and refers to the fact that the climate of this country is favorable to a high rate of adhesion. My experience in this matter leads me to consider $\frac{1}{3\frac{1}{2}5}$ a better proportion for all classes of engines, and I consider an engine with more than $\frac{1}{4}$ to be over-cylindered, and such engines require an abundant supply of sand to offset bad design.

F. W. JOHNSTONE,
Supt. M. P. & M.

Locomotive Boiler Explosions.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I see an article on the boiler explosions, also one by "Master Mechanic," which in your footnote is indorsed by the *Gazette*. As your paper is for the purpose of circulating information, I will give you and the "Master Mechanic" a pointer or two. A few years ago a new locomotive, of the Wootten type of boiler, was built by the Baldwin Locomotive Works for the Baltimore & Ohio which exploded its boiler after a very short time on the road. It was on a passenger train and was near Canton station when it happened. About a year ago one exploded in the P. & R. roundhouse in Philadelphia, near Twentieth and Hamilton streets: reported cause, broken staybolts. Not far from that time one or two of them exploded near Shamokin, Pa., also another one on the Bethlehem branch of the P. & R., and as for their breaking staybolts, they were noted for that on the D., L. & W., also on the Lehigh Valley.

But when "Master Mechanic" says boilers explode because they are not strong enough to stand the pressure, I heartily agree with him, and am not afraid of staybolts that do not go through the sheets at right angle exactly. Staybolts do not pull out of the sheets; the trouble is they break, and when this occurs the thread in the sheets is not in fault.

D., L. & W. ENGINEER.

PITTSBURGH, Pa., Nov. 3, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The errors of fact which are apparent in the communication of "Engineer" on locomotive boiler explosions in your last issue, as well as the opinions expressed therein as to structural characteristics and their assumed results, indicate that "Engineer" has allowed his zeal to outrun his discretion, in wasting the ammunition he should economize for his attack on the Wootten boiler (which is the *animus* of his article), in a general and sweeping denunciation of the radial stay system. The general and almost universal adoption of this mode of crown sheet staying, for boilers of the ordinary narrow firebox type, in recent and present locomotive practice, does not substantiate his view that boilers in which it is employed are constructed on "unmechanical lines" or are "self-destructive," but passing this question for the moment, his assumption that radial stays are, in and of themselves, a feature or a necessary element of the Wootten boiler is, upon its face, absolutely incorrect and unfounded.

He says that "another Wootten boiler has gone the way of its kind—blown to bits in the air" [It was not a Wootten boiler.—EDITOR.], but gives no figures whatever in support of the remarkable proposition that these boilers, as a general rule, explode. So far as the writer has been able to learn, only two of them have done so since the type was introduced, one on the Baltimore & Ohio and one on the Reading, and inasmuch as more than 600 are now in service, this may fairly be termed a small percentage, compared with the record of similar accidents in boilers of the ordinary form.

It is next asserted that the Wootten boiler is a "very unreliable and dangerous form of construction." No reason is assigned for this statement, but the closing lines of the article imply that the alleged unreliability and danger of the boiler are due to the use of radial stays. The great majority of locomotive boilers of the *ordinary* type recently constructed are provided with radial stays, and therefore must be just as "unreliable and dangerous" as "Engineer" claims the Wootten boiler to be.

A discussion of the merits of the radial stay need not be here entered upon. Like Prohibition which does not prohibit, and Protection which does not protect, the defect of the radial stay is that it is not *radial*. It is, however, sufficiently so for all purposes of practical service; it has made crown bars a relic of barbarism; and it stands to-day as the most generally approved and accepted type of crown sheet support. The Wootten boilers heretofore constructed have had radial stays, but it is evident that their fixeboxes could be made with Belpaire tops (a construction which is exempt from the theoretical defect of the radial stay), without any departure whatever from the structural features which characterize this boiler and differentiate it from the ordinary narrow firebox type. Belpaire tops for Wootten boilers have been proposed by an eminent authority on locomotive construction, and will, in the writer's opinion, be adopted in the near future.

The statement that "we hear of explosions every few months on the Reading Railroad" is very loose writing, and is unsupported by statistics. It is, however, true that within the last 18 months, *three* engines exploded on that road from low water, neither of which had either a *Wootten boiler* or *radial stays*.

It may be true, as stated by "Engineer," that there is no excuse for explosions from low water, and that properly constructed boilers *ought* not to rupture from low water. Unfortunately, however, the fact remains that they *do*, and if a Wootten boiler is abused and neglected in this regard, the natural result will be the same as with any other locomotive boiler—an explosion.

The merits of a corrugated cylinder firebox in marine practice are undoubted, but it has not so far been demonstrated to be sufficiently successful in its adaptation to a locomotive boiler, to justify its general adoption. The radial stay boiler, like the poor, we have always with us, and it will *stay* for some time to come. No difficulty has been found by our leading locomotive builders in attaining, with radial stays, the advantages of ample strength, lightness, economy and avoidance of scale deposits incident to crown bars; and whether applied in a Wootten or a narrow firebox boiler, they will be found in the future, as they have been in the past, neither "unreliable" nor "dangerous," so long as the simple, but indispensable, requirement of keeping water on top of the crown sheet is complied with by those who are most nearly interested in preventing the engine from being "blown to bits in the air." J. SNOWDEN BELL.

American Practice in Rail Making.

54 Pine Street,
NEW YORK, Oct. 31, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In Mr. Sandberg's interesting letter of October 7, in reference to heavier and harder rails, he says: "Your American practice seems to differ widely from ours in Europe." In some respects it must do so, as the service is much more severe. Our freight car tonnage ranges from 9,000 to 11,000 lbs. per wheel in loaded cars, while 15,000 to 18,000 lbs. are common weights upon our locomotive drivers. A number of our passenger locomotives have now 20,000 lbs. per driver. Our freight locomotives are sufficiently powerful to haul 30 25-ton cars (gross load 36 to 38 tons of 2,000 lbs.) up grades of one per cent., while on level lines 50 to 60 of the heavy cars are taken as a train load. Running around curves of only three to five degrees, the service on the rails is very severe. The traction exerted by the large freight locomotives is often 12,000 to 16,000 lbs., distributed through six to eight points upon the rail, requiring a steel of high elastic limits to withstand the severe surface strains without rapid wear. The rail should not only have sufficient strength as a girder to safely carry the train, but a metal of such physical properties as to prevent flow of metal or rapid abrasion of the head.

What Mr. Sandberg says about the importance of introducing heavier rails will be read with great interest, and meet with general indorsement, but as he says, "You have the advantage in America of close sleepers," and in stability of track he has been well anticipated in the extensive use by our large lines of 5-in. 75, 80, 85, 90, 95-lb. rails.

For a given rail and load the deflections are practically as the cube of the span of the sleepers, therefore if we call the deflections 1 for sleepers of 2-ft. centres, the deflection for sleepers of 2 ft. 6 in. centres will be 1.9; for 3 ft. centres 3.4, and for 3 ft. 6 in. centres 5.3. To equal the stability of our track upon close sleepers of 2 ft. or 22 in. centres, as on many of our roads, the rails must be increased very rapidly in stiffness as well as weight.

The undulation in 11 ft., under six tons per wheel, on our rails of 75, 80 and 95 lbs. in many of our tracks only ranges from one-eighth to one-twelfth of an inch. This is about the limit to which the trackmen can surface, as the rails when not under loads appear to be in surface, to the eye. On such tracks the cars glide with but little motion even for a speed of a mile a minute. The improvement which has taken place in the standard of our tracks in the past ten years has been very great, and is one of the important matters to which great attention is given by our railroad officers, for they not only require them to be in a safe condition but up to a high standard for economical operation. Annual inspections of the tracks are made, headed by the President, General Manager, Superintendents, and all officials connected with the Maintenance of Way Department, accompanied in many cases by a car with apparatus which makes a mechanical inspection, giving the detail of the condition of every rail in the track.

No manager takes any chances as to the safety of his track, but, on the contrary, requires vigilance in all that pertains thereto. They are also increasing the weights of the rail per yard, and laying many thousand tons yearly. In 1884 the New York Central & Hudson River commenced putting down the exceedingly stiff, 5-in. 80-lb. rail I designed for them, and it is now laid all the way from New York to Buffalo and return, and on this rail they lately ran a mile a minute for over seven hours. This track will compare favorably in stability with any 85 or 90-lb. section of rail I have seen, supported on wooden sleepers 2 ft. 6 in. from centre to centre. This rail was quickly followed by other 5-in. 80-lb. rails, then by 85, 90 and recently by 95-lb. rails. [See another article in this issue.—EDITOR.] Our tracks are not only safe, but must be in good condition to haul a considerable portion of Europe's wheat supply 1,000 miles for 25 cents per hundred, a rate which could not be obtained in any other country.

HARDNESS OF RAILS.

Could Mr. Sandberg see the effects of service upon

our steel rails he would realize the conditions we must meet far better than we can expect him to do from our descriptions. Upon our gradients and curves it is common to see, especially on recent 35 to 40 carbon, deep headed rails, extensive flow of metal on the heads, layer after layer of metal being started from the centre of the head and forced one over the other until the accumulation becomes detached from the rails in pieces from ⅛ in. to ¾ in. wide, and from 3 in. to 1 ft. long; the rails losing rapidly in vertical height, especially the inside rails on curves. On the outside rails, beside an outward flow of metal taking place, the inside of the head rapidly abrades, cutting away from one-quarter to one-third of the rail, unless removed from the track. Most rails are removed for safety by the time one-fourth of the width is cut away. The older, physically harder rails, under the same conditions of traffic, do not flow or abrade so rapidly, and though lighter in section have not on the inside of the curves broken so frequently in the track as the softer rails.

Hardness of rails must be determined physically as well as chemically. For the former, as a final result, determines the quality of the rails to resist wear under hard service. Our present methods of quick rolling with reduced number of passes per rail do not give for the same carbon as high physical properties as formerly. But to obtain them we may start with a higher grade of steel in the ingot.

With carbon up to .60 and phosphorus down to or below .06 a grade of rail steel has been made which is not only physically hard but tough, the metal in the rails giving 12 to 18 per cent. elongation under the drop (see drop tests of high carbon rails in this issue of the *Gazette*). Such metal equals or excels the best quality which has rendered safe service in our rails for years, and with the sections in which it is being used we are increasing the factor of safety instead of lowering it, as Mr. Sandberg seems to think. In this country we have an excellent opportunity to study the wear of many rails made under Mr. Sandberg's care in comparison with those made here. Chemical analyses do not show that the English rails have less phosphorus than those made in some of our eastern mills, but on the other hand more. Our experience here confirms his view that phosphorus hardened rails are more liable to break than carbon hardened rails in cold weather, and that is why we avoid it.

With the English rails of .10 to .12 phosphorus on our close ties we have not had many breakages unless cold flow of metal had taken place on the top of the head. And it would be interesting to know whether the phosphorus rails to which Mr. Sandberg refers as becoming brittle after a few years' servie, fracture from the base upward or from the head downward. Some years since I tested a number of rails having .10 to .12 of phosphorus, after 10 to 15 years' service. But I did not consider that the metal in the web and base had grown brittle by service on our close ties. With longer sleeper spacing causing greater strains in the head and base of the rail the tendency would be to make the rails brittle.

SECTIONS.

Mr. Sandberg says: "American sections of flange rails are generally wider and thinner than the European ones, which will be another cause of fracture." This would be the tendency of introducing more carbon into thin flanged rails and should not be attempted. Since I introduced the 80-lb. N. Y. C. & H. R. section, having a heavy base, which has been so extensively followed, our modern sections have not only thick bases but thicker webs and thinner heads, making the entire metal in the section more homogeneous, reducing the internal strains between the head and the base, enabling us to use a higher grade of metal. Mr. Sandberg is correct in his opinion that "the wider and thinner heads check the flattening of the rail ends without having extreme hardness," but medium hardness is not sufficient to prevent rapid flow and abrasion of our rails on what is for many lines ordinary service. Experience shows that this must be met by a physically hard but tough metal, and what we are trying to do is to secure a *safe and hard* one, giving a slow rate of wear, so that the section will retain for a long time nearly its original form and stiffness. Rails lose their stiffness in a much faster ratio than the loss in height of the section, and often require removal from the track on account of loss of stiffness more than loss in weight of metal.

In conclusion we must thank Mr. Sandberg for taking so much interest in the progress of rail making in this country. We are forced to go ahead, but we can assure him it will not be done by the sacrifice of safety. We have too high a regard for the safety of our own lives, as well as those of our children, to ride on unsafe rails.

P. H. DUDLEY.

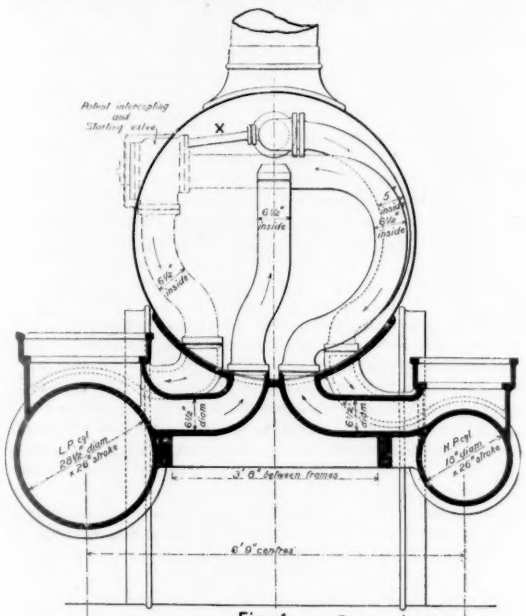

Fig. 1.

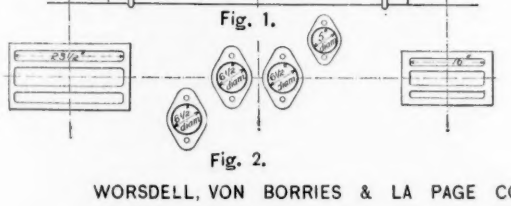

Fig. 2.

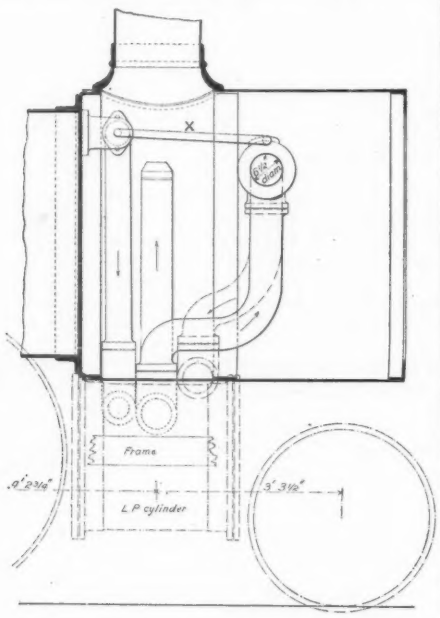

Fig. 3.

WORSDELL, VON BORRIES & LA PAGE COMPOUND—GRAND TRUNK RAILWAY.

Worsdell-Von Borries Compound—Grand Trunk Railway.

We illustrate a compound locomotive that has been recently designed for the Grand Trunk Railway of Canada by Messrs. Taite & Carlton, London, England, who are represented in this country by Mr. Geo. L. Fowler, 53 Broadway, New York. The engine is designed on the lines of the Worsdell and Von Borries system, and is provided with the Von Borries intercepting valve.

The principal dimensions of the engine are as follows:

Diameter H. P. cylinder	18 in.
" L. P. "	28½ in.
Stroke of pistons	26 in.
Width H. P. steam ports	1⅝ in.
" " exhaust port	3 in.
Length H. P. ports	16 in.
Width L. P. steam ports	2¼ in.
" " exhaust ports	4 in.
Length L. P. ports	23½ in.
Lap of all valves	1⅝ in.
Valve travel for middle position of link	3¼ in.

Other dimensions and details are shown on the engravings. The link hangers are made of different lengths so that a cut off of 0.4 in the H. P. cylinder corresponds to one of 0.5 in the L. P. cylinder, while the greatest cut-off to be used in running forward is 0.75 in the H. P. cylinder and 0.8 in the L. P. cylinder. The diameter of the exhaust can be placed anywhere between 4¾ in. and 5¾ in.

Fig. 1 is a cross-section through the smokebox showing the location of the intercepting valve, and the arrangement of the piping; the arrows showing the course of the steam from the dry pipe to the exhaust. *X* is the steam pipe leading to the intercepting valve by means of which steam is admitted to the L. P. cylinder at starting.

Fig. 5 is a section of the latest design of the Von Borries intercepting valves, and differs slightly in outline from that shown in fig. 1. Its operation is entirely automatic, and is as follows: When the throttle is opened steam enters the passage *C* by way of the pipe *X*, fig. 1, and pressing against the shoulder of the steel spindle *D* pushes it into the position shown in the engraving (fig. 5), and thus closes the main valve. The steam then passes around the spindle, out through the ¼-in. openings *G* and into the chamber *B*, which communicates with the receiver. Then it has free access to the steam chest of the L. P. cylinder. It also acts against the piston *E* through the passage *F*, but the greater area of the main valve keeps it closed.

When the H. P. cylinder exhausts into the chamber *A*, the pressure, which has heretofore been equal to that of the atmosphere, rises on that side of the main valve and thus balances the receiver pressure. Then, as the area of *E* is greater than that of the shoulder on *D* the valve is moved to the right and the communication between the H. P. exhaust and the receiver is again established. In this position the larger portion of the stem *D* closes the openings *G* and the engine works as a compound. It may be added, that the openings *G* are so graded that the steam is wire drawn down to the proper pressure for admission to the low pressure cylinder.

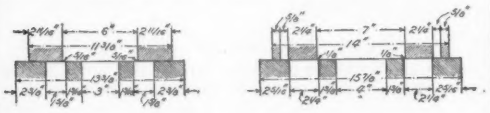

Fig. 4.

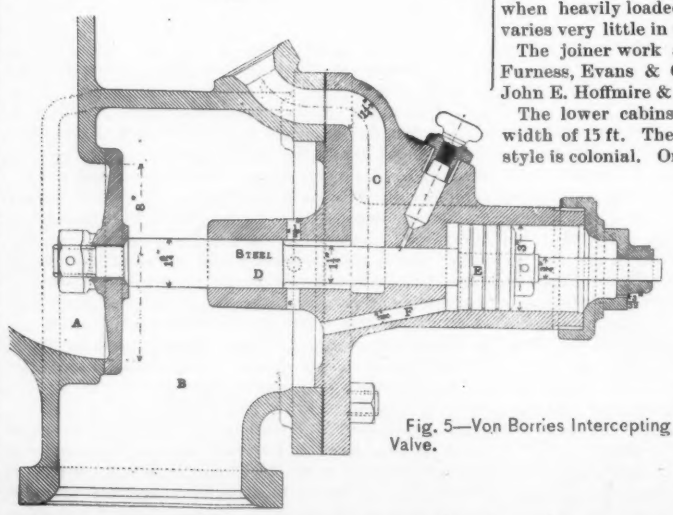

Fig. 5—Von Borries Intercepting Valve.

The Pennsylvania Railroad Co.'s Screw Ferry-Boat "Cincinnati."

[WITH AN INSET.]

The ferry-boat "Cincinnati," drawings of which are presented with this issue, represents the latest ideas in ferry-boat construction and was designed for ferry service between New York City and the Jersey City station of the Pennsylvania Railroad. It is screw propelled and has an upper deck level with the elevated station in Jersey City, so that passengers from the trains, without going up or down a flight of stairs, can cross West street on a bridge and avoid the disagreeable grade-crossing.

Cabins.—The decorations of the boat are very elaborate and are different from anything yet seen on a ferry-boat. There is seating capacity for 470 persons and about 4,500 sq. ft. of floor space. The space for the teams is 10 ft. 6 in. wide, 13 ft. high and long enough to accommodate 12 five-ton trucks. The water line area is as large as it is possible to obtain and admit of a good form of hull. The sides of the boat are flaring instead of upright; these latter features give the boat greater stability and considerably lessen the increased immersion when heavily loaded; the deck of the boat therefore varies very little in the height above the water.

The joiner work and decorations were designed by Furness, Evans & Co., of Philadelphia, and built by John E. Hoffmire & Son.

The lower cabins are 144 ft. long, with an average width of 15 ft. They are painted a metal gray, and the style is colonial. On the sides above the seat arms are the conventional colonial panels, above which are large canvas panels, stippled to produce a rough surface. Above this on the entablature is a festoon, then dentils, and at the top a very elaborate cornice. The festoon, dentils and moldings in the panels and cornice are taste fully covered with silver leaf; the effect is soft and very pleasing to the eye.

The windows are large and of heavy plate glass, with leaded glass designs at the ends and in the centre of the cabin. The seats are of mahogany in narrow strips, with bent wood arms. The floor is covered with red mosaic tile. In the centre of the cabins, instead of

the usual unsightly wheel house, is a very elaborate stairway of mahogany, with handsomely carved newels and panels, leading to the upper deck. Over the stairway is an oval-shaped dome terminating in the roof of the upper deck; the sides of the dome are of leaded glass in very pretty designs.

The upper cabin is 87 feet long and 38 feet wide, with ciruclar ends, the house in the middle being seven feet wide. The style of decoration is very similar to the lower cabins, except the color used is rose pink, and the floor is covered with Brussels carpet.

The Hull.—The hull is of iron and was built by the Crescent Ship Yard & Iron Works. It is of the following principal dimensions:

Length over guards	206 ft
" on water line	200 "
" on keel	180 "
Beam over guards	65 "
" of hull	46 "
" on water line	38 "
Depth amidships	17 "
" at ends	16 "
Draft	10 ft. 10 in.
Displacement	890 tons.

There is a centre through plate keel and keelson 33 in. deep, ⅝ in. thick, with side bars 8 in. × ⅜ in.; and with the garboards flanged down 8 in. and through riveted. The frames are of 3 in. × 4½ in. × ⅝ in. angle bars; the floor plates are 18 in. deep and ⅝ in. thick, and the reverse frames are 3 in. × 3 in. × $\frac{5}{16}$ in. angle bars; these are spaced 21 in. apart amidships, 15 in. apart at the ends' and are riveted to the centre keelson by two 3 in. × 3 in. × ⅝ in. angle bars. The deck beams are of 6 in. × $\frac{7}{16}$ in. angle bulb bars, one on each frame, and are supported immediately beneath the team gangways by 3 in. iron stanchions. There are four side and bilge keelsons, each formed of two 4 in. × 3 in. × ⅝ in. angle bars; and five belt frames of 16 in. × ⅝ in. plates, on each side of the boat.

The hull is divided into 14 water-tight compartments by five transverse bulkheads and two longitudinal bulkheads. The transverse bulkheads are ¼ in. thick, except the end or collision bulkheads which are $\frac{5}{16}$ in. thick, and extend from the keel to the deck. The longitudinal bulkheads are 14 ft. each side of the centre line of the boat, and extend from collision bulkhead to collision bulkhead, and from the skin of the vessel to within 2 ft. 6 in. of the deck. These longitudinal bulkheads are a protection from sinking in event of damage to the side of the hull.

The hull plating is generally ½ in. thick; under the bottom it is made lighter; at the ends and at the water line, where it is likely to encounter ice, it is heavier, as shown on the drawings. The deck is covered completely with iron $\frac{5}{16}$ in. thick. The centre house is also of iron and extends to the top of the upper deck house, so that should a fire occur in the hold it could hardly reach the woodwork above the main deck.

The guard beams are 6 in. × ⅝ in. angle bulb bars, connected to the hull by gusset plates; their outer ends are riveted to a box shaped girder, formed of ⅝ in. plates and angles, to which is fastened the 8 in. × 12 in. oak fender pieces, and the 4 in. × 12 in. oak wearing piece. This girder is supported by struts, or braces, of 2½ in. round iron extending out from the hull. The wood deck over the iron is 4 in. × 4 in. white pine, and the house sills and wagon coamings are 12 in. × 16 in. white pine.

Engines and Boilers.—The machinery was built at the company's shops at Hoboken. The boat is propelled by a four-bladed screw propeller at each end, 8 ft. 9 in. diameter, 13 ft. 6 in. pitch, working in unison and connected by a 9-in. wrought iron shaft, extending from end to end of the boat. The propellers and rudders are submerged 14 ins. below the surface of the water, so as to be as far as possible below the ice and drift wood. The screws are actuated by two steeple compound engines, coupled together. Each high pressure cylinder is 18 in. diameter, each low pressure cylinder 36 in. diameter, and the stroke is 26 ins. They are so arranged that should one engine break down it can be uncoupled and the boat continue at reduced speed with the other engine. The Joy valve gear and Canfield's patent piston valves are used with steam and hydraulic gear for reversing.

The condensing apparatus is independent of the main engines. The condenser is cylindrical, 4 ft. 6 in. diam., 12 ft. 3 in. long, and has 1,950 sq. ft. cooling surface. The cooling water passes through the tubes and is provided by a 10-in. centrifugal pump, driven at 230 revolutions per minute, by a 7 in. × 7 in. vertical engine. The air pump is of the Knowles pattern, with 10-in. steam cylinder, 12-in. air cylinder and 16-in. stroke.

Steam is furnished by two return tubular flue boilers, 10 ft. diam., 16 in. long. Each boiler has two furnaces, 42 in. diam., giving 49 sq. ft. grate surface and 1,750 sq. ft. heating surface, and is tested for a working pressure of 120 lbs. One of the economical features in the design of a ferry-boat for this service is that it is wasteful to have the boiler power equal to that of the engine, as over one-half of the boat's time is spent in the ferry slips. As the engines are idle so long, loss in the boiler pressure while crossing the river is desirable; so that with nearly uniform firing the boilers will not "blow off" while waiting in the ferry slips. On the test trips that have been made a uniform boiler pressure of 97 lbs. was maintained for two hours; the main engines made 92 revolutions per minute and developed 720 I. H. P., which gave a speed of 12.25 miles per hour. When the boat was stopped and the steam pressure allowed to reach 115 lbs., the engines showed 1,016 I. H. P. and two miles were made in eight minutes, or at an average rate of 15 miles per hour; the steam pressure at the end of this run had fallen to 88 lbs. The tests showed that the boilers burned 12.85 lbs. of coal per square foot of grate per hour and had evaporated 9.72 lbs. of water to 1 lb. of coal. The firing was done by one of the ferry service men, and the engines were handled by the boat's regular engineer.

Lighting, Heating and Ventilation.—The boat is lighted entirely by electricity by about 200 incandescent lamps, of 16 c. p. each, supplied by a U. S. Electric Light Co's dynamo, of 70 volts 250 ampére output, driven by a 7 in. × 10 in. "Ideal" horzontal engine. The lamps in the cabins are placed along the sides, over the seats, and held in silver plated fixtures. The wires, though concealed, are so placed in the moldings of the joiner work that they may be easily gotten at in case of breaking.

There are about nine lights in series on each circuit, and safety fuses are placed in front of each lamp, so that the failure of one lamp will not destroy the balance on its circuit. It is the intention that no oil lamps shall be used, so there will be no flame of any nature above the main deck. To guard against the possible loss of light, by the failure of the main dynamo, a smaller machine of 70 volt 30 ampére capacity is installed, and is connected with the signal lamps, as well as several of the lamps in the cabins and hold, it is driven by its own engine and is ready for instant use.

In the day time the smaller machine is used for lighting the hold of the boat.

The heating of the cabins is on the Sturtevant hot air system. The apparatus is placed in the hold of the boat, abaft the main engine. The fan is 54 in. diameter and is driven by a two-cylinder 5-in. × 4-in. vertical engine, directly connected to the shaft carrying the fan. The air is drawn down from the outside above the hurricane deck, and is heated by being forced past a coil of steam pipes, it then passes through separate ducts to each cabin, and is delivered into them through outlets in the sides near the ceiling. Air is being constantly forced in, and in sufficient volume to make a complete change every five minutes. The temperature is regulated by a thermostat, placed in each cabin, which, when the temperature varies five degrees from that desired, operates a valve in the heating apparatus in the hold. This valve decides whether the air delivered from the fan to the duct shall be hot or cold, and in this way air of the proper temperature is delivered into the cabins. To provide for the escape of the foul air outlets are led, through the cabin partitions, into the team gangway.

Steering Gear.—The Williamson steam steering engine is used; but the band gear is always connected up, and is ready for instant use in case of accident to the steam gear. Each rudder is provided with its own gear and is independent of each other. The Williamson engine consists of two horizontal cylinders, placed parallel with each other, with the cranks following at right angles on a shaft, upon which is a worm, 5 ins. diam.; this worm gears into a worm wheel, 24 ins. diam., that has a drum, 14½ ins. diam., upon its shaft. The rope from the tiller passes around this drum. The admission of steam to start the engines is controlled by a valve, which has its stem or shaft leading to the pilot house. The engines operate as long as this shaft is kept revolving, and immediately it ceases the engines cease. The direction in which the shaft revolves governs the direction of the engines, either forward or back, revolving the drum either to port or to starboard. The rudder is held in the position placed by the worm engaged in the worm wheel.

There are mechanical telegraphs between the engine-room and pilot house, which show the engineer the direction in which the boat is going, and the pilot the speed and direction in which the shaft is revolving. To provide against the possibility of fire in the hold all platforms, gratings, lockers, benches, etc., are made of iron, and no wood whatever is used in the construction of the boat below the main deck.

The boat was designed and built under the direction of Mr. Hayward, the Superintendent of Motive Power at Jersey City, and shows the result of experience and careful study of the many features of ferryboat construction.

Fast Run on the Michigan Central.

The Michigan Central ran a special train for the Boston Commercial Club from Chicago to Buffalo Nov. 1, which made a very good record. The train was made up of two Wagner vestibule sleepers, a combination car and a dining car—four cars in all. It left Chicago at 10:30 a. m., arrived in Detroit at 4:29 p. m., left Windsor at 4:58, and arrived in Buffalo at 11:03. The 285.5 miles from Chicago to Detroit was thus made in 5 hours and 59 minutes, and the 250 miles from Windsor to Buffalo in 6 hours and 5 minutes. The crossing of the Detroit River, reckoning from the arrival of the train in Detroit until its departure from Windsor, was made in 29 minutes, which is considered a quick passage. The total interval from the departure from Chicago to the arrival in Buffalo was 12 hours and 33 minutes, making the average run for the 536.5 miles 42.8 miles per hour, including all stops and the Detroit ferriage. The North Shore Limited is scheduled for the same run in 14 hours and 40 minutes, or 2 hours and 7 minutes slower, and the Lake Shore Limited, for the 540 miles between Chicago and Buffalo by that route, in 14 hours and 10 minutes, or 1 hour and 37 minutes slower.

The run from Chicago to Detroit was the quickest ever made between those cities. The grades favor westbound trains and the next best record was made in that direction, being 6 hours and 8 minutes from Detroit to Chicago. At 5 hours and 59 minutes for 285.5 miles, the average rate of speed was 47.7 miles per hour. The station stops for water, orders or other detentions amounted to 27 minutes. This reduces the actual running time to 5 hours and 32 minutes, not making any allowance for three grade crossing stops, or at the rate of 51.6 miles per hour. In detail the run was as follows:

		Minutes.	Miles.
Chicago, Depart	10:30		
Kensington, Arrive	10:57	27	15
" Depart	11:02		
Michigan City, Arrive	11:50	48	42½
" Depart	11:54		
Niles, Arrive	12:38	44	36½
" Depart	12:43		
Kalamazoo, Arrive	1:38	55	48
" Depart	1:41		
Battle Creek, Arrive	2:08	27	23
" Depart	2:10		
Jackson, Arrive	2:59	49	45
" Depart	3:04½		
Ypsilanti, Arrive	3:54	49½	46
" Depart	3:56½		
Detroit, Arrive	4:29	32½	29½
		5 h. 32 m.	285½

Chicago to Michigan City, engine 256, 60-in. drivers.
Michigan City to Jackson, engine 20, 68-in. drivers.
Jackson to Detroit, engine 250, 60-in. drivers

All the engines were built by the company, and have 18x24-in. cylinders.

This train traveled over the West Shore and the Fitchburg and made good time through between Chicago and Boston. The distance is 1,017 miles, and the eastbound trip was made in 27½ hours, including a stop of over two hours at Buffalo. On the Fitchburg, which lies through a hilly country, 40 miles was traversed in 49 minutes, and the tortuous road between North Adams and Greenfield, 38 miles, including the Hoosac Tunnel, was covered in 53 minutes. On the westbound trip the 46 miles from Syracuse to Lyons on the West Shore was covered in 48 minutes.

The Chicago, Rock Island & Pacific last week ran a train, carrying Gilmore's band, from Beatrice, Neb., to Denver, 493 miles, in 12 hours and 45 minutes, including one stop of 50 minutes. It is said that the running time, exclusive of stops, was 50 miles an hour.

A special train on the Erie last week ran from Buffalo to Jersey City in 9 hours 20 minutes.

New Downtown Terminal for the West Shore.

The West Shore has plans prepared for new terminal buildings in New York City that will be roomy and well appointed. The present downtown terminal is at the foot of Jay street, and is too small for the business of the company in the lower part of the city. The ferry-house when originally built was not intended to be a permanent structure, and but little expense was put into the building, which is a one-story shed at the end of a long walk leading from West street. The new terminal buildings will be between Harrison and Franklin streets. The negotiations that have been pending with the city are now satisfactorily concluded, and the latter has already finished part of the work incident to the general improvements. The city has completed a fine dock north of the ferryhouse site, and men are now filling in the dock from West street for the site of the new building.

The pier will be covered, the railroad company assuming that part of the expense. The pier is already in use for float freight from Weehawken, and about 100 cars a day are being unloaded. The location of the new pier is a particularly desirable one in view of its close proximity to the butter and cheese market, because a large portion of that produce from New York State comes over the West Shore and the New York, Ontario & Western railroads. Another reason why the new location is more desirable than the present one is that both the Sixth and Ninth avenue elevated railroads have stations at Franklin street.

The plans for the new terminal buildings were made by Mr. Walter Katté, Chief Engineer of the New York Central & Hudson River. General Manager J. D. Layng and General Superintendent C. W. Bradley of the West Shore Railroad have had the question of the new station under advisement for a long while. The buildings will be on a line with the Chambers street ferryhouse of the Erie Company, which is the new building line fixed by the street and dock commissioners. Under its lease the New York, Ontario & Western Company will share the new terminal with the West Shore Company.

The buildings consist of a covered pier 677 ft. long and a two story headhouse 230 ft. long on West street. The headhouse contains the passenger waiting-rooms, ticket offices, etc., the scales and offices for receiving and delivering freight, and in the second story, offices for the employés of the company. The portion of this structure which is occupied by the passenger and ferry house proper is 80 ft. front on West street, and extends back 170 ft. flanking the pier. The ferry bridge is 40 ft. × 70 with a 13 ft. wagon driveway in the centre and 13 ft. sidewalks on either side. There is a large skylight over the central passage way, and the building will be pro-

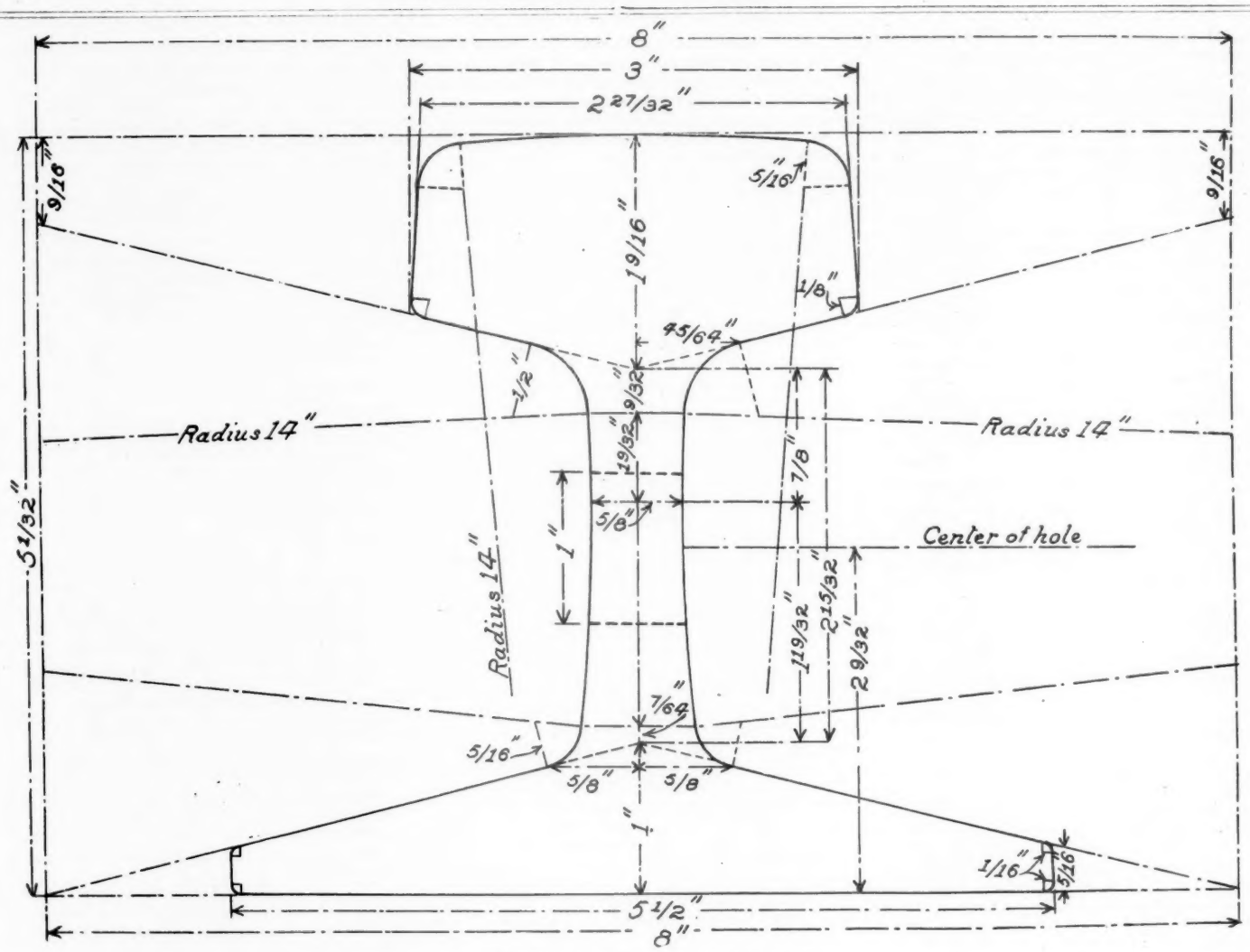

Fig. 1—BOSTON & ALBANY 95-LB. RAIL.

Full Size.

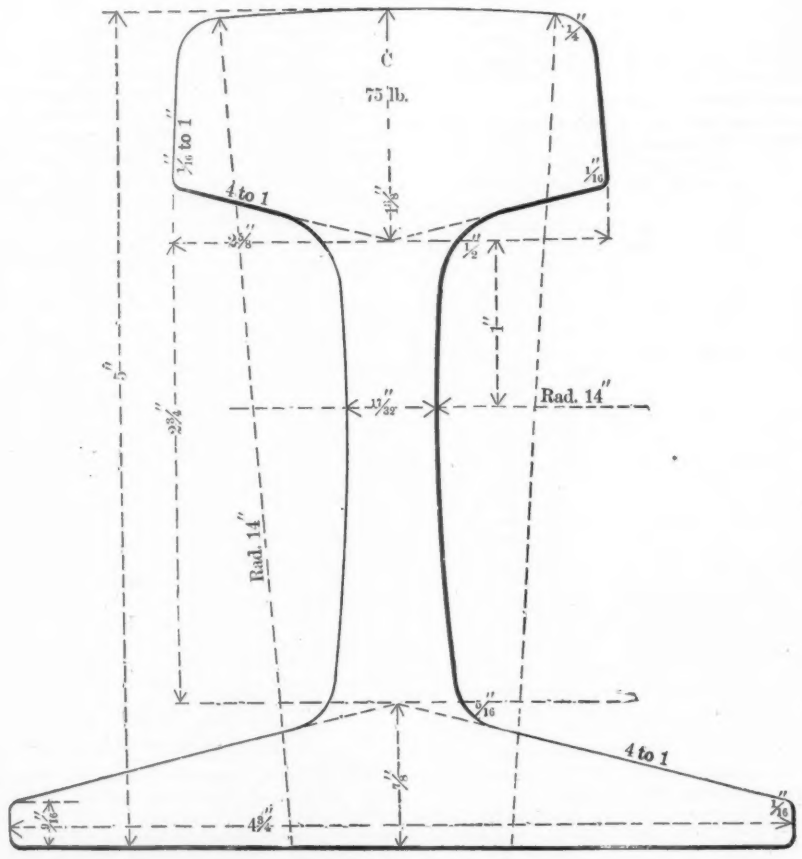

Fig. 2—Dudley, 75-lb. Rail.

vided with steam heating, gas and water service and wired for electric lighting. The main thoroughfare to the ferryboat will be lighted by arc lights.

On the West street side will be a to ver rising 100 ft. above the street, which will be provided with a four-face clock placed 60 ft. above the street level. The freight shed occupies all of pier No. 23, being 672 ft. in length and 65 ft. wide. This is provided with skylights and gas, together with suitable water service pipe and fire hydrants. The frame and roof will be of wrought iron covered with galvanized sheet iron, the roofing to be Warren's anchor brand asphalt and gravel. In a later issue we shall show drawings of the buildings and piers.

Recent Experience in Making Hard Rails.

BY P. H. DUDLEY.

The first order for 5,000 tons of the Boston & Albany 95-lb., .60 carbon rails was rolled by the Bethlehem Iron Co. in April and May, and a second order for the same quality and amount was rolled in June and July. By the 1st of October 66 miles of the rails were laid, making a track of great stability and smoothness.

As shown by the section of the Boston & Albany 95-pound rail in Fig. 1, the head and base are wide, forming the largest dimensions and weight of section of any steel T-rail rolled to date in this country. By many it was not considered feasible to roll so wide a base, so much desired by the railroad company, and, while presenting increased difficulties they were very well overcome by trial and care. The weight and height of the section were fixed by the Boston & Albany officials, and I distributed the metal, permitting the rolling under existing practice of a high carbon rail, low in phosphorus, which would be physically hard, though characterized by toughness instead of brittleness.

The tendency of improvement in steel is, while making it physically hard, to give it a toughness enabling it to stand more work before distortion, and afterward to have several per cent. of elongation before breaking. This is what we need for our rails to withstand the severe service of to-day. The metal must be physically hard and tough to prevent flow under the weights of the wheels, the resistance to traction of the locomotives, and fracture of the section under the loads. The tracks of the Boston & Albany Railroad furnish excellent opportunities to study the comparative wear of physically hard and soft rails under hard service, which show so decidedly in favor of the former, that in considering the qualities of the metal for the 95-lb. rails, the only difference of opinion was as to the degree of hardness which would be safe. I proposed .60 in carbon, and not exceeding .06 in phosphorus, with restrictions as to the other metalloids, and so prepared the specifications, knowing from the experience of some exceptionally high carbon rails which had been 20 years in the track that they could be made hard, tough and safe. In this view Mr. John Fritz, the General Superintendent of the Bethlehem Iron Co., concurred on examination of the Boston & Albany 95-lb. section. The matter was considered for some time by Mr. Bliss, President of the Boston & Albany Railroad Co., and finally adopted.

The large section required special blanks for the rolls, and in the meantime, before they could be obtained and finished, a contract was made with Dr. W. S. Webb, President of the Mohawk & Adirondack Railway Co., for 18,000 tons of rails of my 75-lb. section (shown in fig. 2), which was especially designed for high carbon rails of decided toughness. Two thousand tons of these rails were rolled under the same specifications as the Boston & Albany 95-lb. rails before rolling any of the latter This was of great assistance, and gave us much information in relation to high carbon rail steel, very essential in making the 95-lb. rails.

The maximum limit of phosphorus being .06 in these

high carbon rails, of course required selected stock. At first some heats were rejected, but by careful attention to every step of the process the product came out in a short time very uniform in quality and tougher than was expected, as shown by the drop tests in tables Nos. 1 and 2. The elongation of the metal in the rail under the drop was from 6 to 8 per cent. for the inch under greatest tension, either for the head or base—and up to the breaking point it was 8 to 16 per cent. Turn the rails upon their sides and let the drop fall 20 ft. upon the edge of the base, the lower edge would elongate 17 to 18 per cent. for the inch under greatest tension, without breaking.

These results show that, with suitable sections and proper stock, high carbon rails can be made of greater toughness than many rails now in use. In hardness they excel most of the rails which have rendered the best service in our tracks. This, of course, should be so, to sustain the increased wheel pressure of to-day without cold flow of the metal in the head. The metal in the entire section of the rails shows great uniformity, and is very free from hard spots.

To plane these rails for frogs and switches requires tools of self-hardened steel, the chips being tough and not brittle. In loading and unloading the Boston & Albany 95-lb. and the Mohawk & Adirondack 75-lb. rails, or in laying them on the track, none were broken, nor have any been reported as breaking in the track to date. This is a better record than even low carbon rails usually make. The elastic limits of the metal in the heads run from 55,000 to 60,000 lbs. per sq. in., and with 12 to 18 per cent. elongation after those limits are reached indicates a safe, high grade of rail steel. The increased cost is small compared to its superior quality.

TABLE NO. 1.—DROP TESTS OF 75-LB. .60 CARBON RAILS, BY P. H. DUDLEY.

Supports, 3 ft. apart; drop, 2,100 lbs.; fall, 28 ft.; April 21, 1891

No. of heat.	Per cent. of carbon.	Deflection in inches.	Remarks.
I.L. 279	.62	2⅜	Head up.
" 42	.62	2¾	" "
" 289	.61	3	" "
" 289	.64	3	Base up, 2d blow 20 ft., straightened.
" 280	.61	3	Head up, 3d " " "
" 989	.54	3	Head up, 1st " 28 ft.
" 989	.54	3	Base up, 2d " " " straightened.
" 989	.54	2¾	Head up, 3d " " "
" 989	.54	2⅜	Base up, 4th " " " straightened.
" 989	.54	.....	Head up, 5th " " " broke.

Experts who were present said "that if these .60 carbon rails stood the drop falling 16 ft. they would be surprised." We have much to learn in regard to the toughness of high carbon rail steel.

TABLE NO. 2.—DROP-TESTS OF 95-LB. .60 CARBON RAILS. BY P. H. DUDLEY.

Supports, 3 ft. apart; drop. 2,100 lbs; fall, 28 ft.; April 28, 1891.

No. of heat.	Per cent. of carbon.	Deflection in inches.	Remarks.
I.L. 822	.59	2⅜	Head up.
" 822	.59	2¾	Base up, 2d blow.
" 822	.59	...	Head up, 3d blow, broke.
" 853	.56	2 1/16	"
" 840	.56	2 1/16	"
" 899	.59	.....	" broke, chilled.
" 887	.58	2 1/16	" very stiff.
" 900	.59	2¾	" stiff.
" 829	.59	2⅜	" "
" 912	.62	2 1/16	" very stiff, broke at the 5th blow of 28 ft.

20 to 50 drop tests were made of each 24 hours run, the same drop being used, but only falling 20 feet, as stated in the specifications.

The Southern & Southwestern Railway Club.

This club convened for its first meeting of the season at the Hotel Duncan, Nashville, Tenn., on September 24. The first subject presented for discussion was the

BREAKING OF LOCOMOTIVE SIDE RODS,

which had been introduced by Mr. J. W. Hemphill, at the St. Louis meeting in April. The subject was opened by the reading of a communication from a superintendent of motive power of a Western road, describing the construction of fluted solid end side rods used by him. These rods are of steel, and the solid ends have the oil cups forged on. The quality of steel from which these rods are made is indicated by the following abstract from the specifications for the material:

"All blooms to be of open hearth steel. One end of each bloom will be drawn down by the manufacturer to a test bar two inches square and 10 inches long, the test bar to remain on the bloom. A test specimen cut from this bar midway between centre and outside should show a tensile strength of 75,000 lbs. per sq. in. and an elongation of 23 per cent. in a test section originally ⅝ in. diameter and 4 in. long. Steel having more than 80,000 or less than 70,000 lbs. per sq. in. tensile strength, or elongation less than 20 per cent. in the specified test section, will not be accepted."

The illustrations show the action of these rods in service under adverse circumstances. Rods 1, 2 and 3 were broken under eight wheeled passenger engines. The immediate cause was the breaking of the rear driving wheel axle close to the hub of the right wheel, and allowing the wheel to fly off and down the bank. This had no sooner occurred than the left hand back wheel also broke and went down the opposite side of the bank. Figs. 1 and 3 represent different views of the same rod. It will be observed that it twisted into almost two spirals before it broke. The rod shown in fig. 2 did not break; it merely got one complete twist. This shows remarkably fine material.

"A short time after this we had a rod, similar in design and on the same class of engine, break while the engine was running about 30 miles per hour. It did not twist, but broke off short. There was no apparent reason for it unless the engine caught on sand on one side. We made laboratory tests of this material, expecting to find a marked difference in it. Rather to our

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Bent and Broken Side Rods.

surprise all showed well, and everything was within our specifications. The results of the tests are as follows:

	Ultimate strength per sq. in.	Per cent. elongation in 4 in.
First rod (figs. 1 and 3) ..	72,100 lbs.	25½ (twisted)
" " (figs. 1 and 3)....	73,100 "	28 "
Second rod (fig. 1).....	76,700 "	29 "
" " (fig. 2)	71,000 "	28 "
Third rod (fig. 4).....	70,700 "	24 (straight)
" " (fig. 4).....	71,500 "	23 "

These two instances cited are the only cases in which fluted rods on this road have ever broken.

Mr. James Meehan stated that, in testing a rod that had cracked or broken, he found that, while the metal might be excellent in some parts of the rod, if he took a test piece as close to the broken surface or crack as possible, he would find the structure was entirely different from the remainder of the rod. It was frequently crystallized, the crystals being very coarse, and the material showed signs of fatigue in every way. He concluded, therefore, that the vibrations of the rods were localized at the point of fracture and for this reason that part of the rod had been gradually reduced to an unsafe condition and had finally cracked or broken. He frequently found this crystalline structure for three or four inches on each side of the break or crack. For eight years he has forged his rods out of selected scrap and none had broken. He is now trying basic steel for rods, and believes it will be better than the Bessemer steel, because it contains less silicon and phosphorus than the latter.

He has also tried solid ends for the back of the main rods, but found that when it became necessary to renew the bushings it was essential that the engines should be run in freight service for a few days to guard against heating. Owing, however, to the inconvenience of withdrawing engines from passenger service the bush has been abandoned. As showing how serviceable such an arrangement is, he stated that one engine had made 127,000 miles without rebushing any of the rods. Mr. W. H. Marshall called attention to the starting of cracks in the straps of the rods on the inner surface from the keyway and oilcup hole, due probably to the sharp corners of the keyway. To remedy the difficulty the oil cups were being forged on and the straps were thickened where the keys passed through them.

The second subject was

THE BEST FORM OF DRAFT GEAR FOR FREIGHT CARS.

This subject had been introduced at the last meeting by Mr. Robert Walker. In his paper Mr. Walker spoke very favorably of the American continuous draft gear. He found that it cost $4.87 per car. The only objection to the device which he had been able to discover was the slackness of the rods which finally takes place from the shrinkage of the timbers, weakness of the springs and the natural wear of the rods. He stated that he had just discovered a simple means for taking up the slack, which consisted in offsetting the drawbar key. This key, which is generally 1×5, can be offset ¾ in. at the ends for the loop, and as it becomes slack the keys can be turned, first at one end of the car and then at the other, until finally 1½ in. of slack has been taken up, which is as much as is usually required. He stated that he was also using a turnbuckle for the same purpose.

Mr. W. H. Marshall called attention to the practice of some roads in placing the draft gear between the centre sills, and thus getting the buffing strains in line with the sills. Mr. Sample, on the Denver & Rio Grande, was using a gear of that kind and had a continuous rod from end to end of the car, which took the place of the ordinary tail bolt. This bolt or rod is made very heavy with a turnbuckle in the centre so that it can be adjusted. The space between the centre sills is filled by blocking, which extends from the back follower plate at one end of the car to the same plate at the other end, thus preventing any liability of the centre sills being injured by severe buffing strains.

Atlanta was selected as the place for the next meeting, which will be held on Nov. 19.

The subjects selected for coming meetings are:

1. Uniformity in locomotive performance sheets, and in the methods of collecting and computing the data embodied in them.

2. Repair work on large systems. Should it be conducted in one large plant, with numerous small plants capable of doing only light repairs, or should the work be conducted in several large establishments distributed over the system, they in turn to be supplemented by smaller shops?

Mr. James Meehan will report upon the first topic, and Mr. W. H. Thomas upon the second.

There was some discussion upon the advisability of abandoning the peripatetic plan of holding the meetings, and of settling down to a permanent place of residence, Atlanta being rather the favorite location. Nothing, however, was decided, though an amendment to the constitution will be proposed at the next meeting, for the establishment of a permanent place of meeting.

Pancoast's Ventilated Car.

The sketches herewith show a recent improvement by Mr. Pancoast in his patented system of car ventilation. He finds the exhaust sufficiently strong to dispense with any intake device other than mere inlets below, and this latter arrangement he considers even better in that there is less liability for the air to stagnate when the car is side-tracked. The improved arrangement gives an equally good vertical movement of the air through the load and provides a better change when the car is not in motion. The whole construction is also less expensive and the roof less encumbered. Further, the inlet is more easily shut off for winter use.

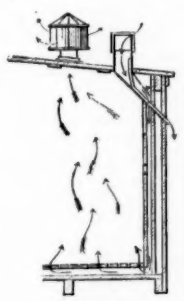

Fig. 1.

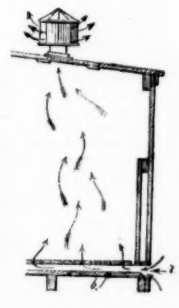

Fig. 2.

Fig. 1 shows the original arrangement and Fig. 2 the improvement. The inlet *i* at the bottom of the car occupies all the available length and is to be provided with a damper arrangement. It can be screened if that is found necessary, which is doubted. As the entrance is below the load any dirt will be deposited on the bottom *b*.

Progress of Cable Motive Power.

At the Pittsburgh convention of the Street Railway Association Mr. James Clifton Robinson reported on this subject, and after a rapid review of the early patents for cable roads, gave Mr. Hallidie's patent in 1872, and the construction of the Clay Street line in San Francisco, as being the first successful application of the principles of cable traction in the world. In 1882, a second object lesson, equally striking, was offered by the inauguration of cable tramways at Chicago, where, in frost and snow, and on level roads with sharp curves the system was triumphantly demonstrated to be of general applicability.

The first cable road outside of the United States was built in New Zealand (in 1882) to connect the suburb of Roslyn with Dunedin. Then followed the Highgate Hill tramway in London, where operations were begun in October, 1883, and the line opened for traffic on May 29, 1884. After London and Edinburgh came Birmingham, where a system six miles long was completed about a year ago. This system now uses animal, steam and electric traction, and, hence, its results will be of special interest.

From the returns just issued I gather the results of the past year's operations to have been as follows:

	Average cost.	Net profit
Steam	22 cents per mile run.	9¾ cents.
Electric (storage)..	19½ " "	10¼ "
Horse.....	19¼ " "	1¾ "
Cable.....	12¼ " "	12⅞ "

Melbourne, Australia, has just completed a splendid system of cable roads, about 85 miles in extent, which is claimed to be not only the largest, but probably the most successful in the world, as it certainly is, financially speaking, the most prosperous.

Reverting to this country the Los Angeles road may be cited as one where the engines, plant and machinery are the ideal of what the power equipment of a modern cable system should be. This road has numerous sharp curves and is pretty severe on the seven cables in use, their life averaging about 10 months only. The cost of fuel ($10.50 per ton and the number of power houses made the initial operating charges rather high, but the substitution of crude oil for coal as fuel has materially reduced these expenses. The speed of the cables averages 8 miles per hour. The system presents many curves of every type and character. In the first section operated, 15,000 ft., there are 14 right angle compound and reverse curves, and yet the facility and safety with which these roads have been operated are gratifying, as far as overcoming practical difficulties are concerned. The total cost of the system was $1,715,590.

Taking the extensions now in process of construction, we arrive at a total of close upon 700 miles of cable road in operation within the United States, besides the lines

existing and under construction on the continent of Europe and in the British colonies. A very large proportion of that mileage has been brought into operation within three years.

Cable roads shall be confined to large cities, and perhaps to those presenting the more severe gradients, having regard not only to the volume of travel, but also to the character and extent of the probable competition. A double track need not necessarily be looked upon as a *sine qua non*, but should be secured wherever it is practicable.

It is unnecessary to recapitulate the details of construction best adapted to secure the best results, but the principle now being wrought out on such a grand scale in New York is that most likely to be accepted. The operation of duplicate cable methods has revealed the possession of so many striking advantages that to describe them in detail would be only a work of supererogation.

Opinion has long been divided as to the relative advantages of concrete and iron as the material to be used in the construction of the road, not only with the regard to the question of cost, but also with regard to the facilities offered by those materials, respectively, in overcoming the difficulties which present themselves in building up a really substantial and serviceable conduit under all the conditions which may occur. I have seen a road built at Oakland, Cal., where the use of iron yoke frames or trusses has been entirely discarded, and the construction of the conduit has been almost exclusively confined to cement concrete, the track and slot rails being retained in position by a series of tie rods, stays and anchor bolts embedded in the walls of the conduit. But the success of the experiment, in view of the contingencies of disintegration and the difficulty of maintenance and renewals, is a subject for doubt.

The forms of conduit in use now, or likely to be brought into use in the future, are: First, concrete as a whole: second, concrete and iron in combination; third, timber and iron; fourth, sheet iron supported by yoke frames on a bed or foundation of solid concrete; and, in the last named form, inasmuch as the yoke frame or truss is intended to preserve the track and slot rails in position. and in performing this duty possesses the inherent weakness of forming an arch minus the key, it will be generally conceded that the suitable design of the yoke frames must always play an important part in the construction of cable roads.

In looking over the ground for the purpose of laying out a cable system, one of the first, if not actually the first, points to be decided upon are the site, location, and extent of the power required to operate the road. The great desideratum is to centralize the power houses so as to command the heaviest strain upon them at about the centre of the system. If the roads are of ordinary grade, conformation and extent, practically any number of cables may radiate from one power house. Single cables have been operated to 35,000 and 36,000 ft., and it is known that on a straight level road at Oakland, Cal., a cable of 39,000 ft. has been operated. But it is not considered safe practice to exceed 25,000 ft. in any one cable. particularly where the road presents unusual difficulties. It is found in practice that every right angle curve on a cable road puts a strain upon the cable plant equal to that entailed upon it by 1,000 ft. of straight road.

In the selection of the engines great care should be exercised, for the power required varies with a suddenness and rapidity almost unknown under other conditions; changes ranging from 50 to 350 H. P. being indicated within the space of a few seconds. From 40 to 60 per cent. of the power used in operating the cable road is consumed in running the dead cable.

Finally the form of the grip to be used may be considered of such importance that it is the focus around which other considerations centre. It might almost be said: "First determine upon the type of grip most suitable, then design and build your road." The varieties of grip will be found to range themselves into two classes, the "side" and "bottom" grip. The "side" grip may be less liable to drop the cable when it is undesirable to do so, but it should not be lost sight of that where quick and positive action is necessary in order to relinquish the cable and regain it at will, the "bottom" grip possesses the advantage.

The speed at which cables may be run depends wholly upon the conditions under which the road is operated. It may be accepted that a cable may be run with safety and advantage on city roads, through crowded thoroughfares and round ordinary curves at a speed of eight miles per hour, while suburban cables running in direct lines to outlying districts may be allowed to attain any speed up to 14 miles per hour. On the Temple street cable road at Los Angeles, the record showed for a 12,380 ft. cable a period of three years and two months in continuous wear, during which time 120,681 miles were run. Market street and Geary street roads, in San Francisco, show, respectively, one year and eight months for 106,225 miles, and two years for 119,153 miles run. On the Grand Avenue road, Kansas City, 18,000 ft. of cable gave constant service for one year and ten months, 135,872 miles, the uniform speed being at the rate of 14 miles per hour, while the Metropolitan cable road secured a success with one year and seven months and 102,359 miles. In Denver a cable 24,000 ft. in length, running around several right angle curves, made a record of one year and eight months with 144,000 miles to its credit, while a 22,000-ft. cable operated by the same company attained a record of nineteen months with 137,280 miles on a road embracing a seven per cent. grade and four right angle curves. The life of the cables throughout the country displays signs of increase, and at present averages about 14 months, giving from 70,000 to 80,000 miles of service. The introduction of the solid steel or interlocked rope with electric welded splice, has not been attended with any degree of success. After a short trial on Brooklyn Heights this class of cable was found unsuitable for the purpose and was withdrawn from use, and the ordinary cable with hempen core was substituted.

The working cost, so far as it has been possible to ascertain, may be placed at 13 cents per car mile, and 60 per cent. of the gross receipts about represents the average expenditure.

The mileage on cable roads by each car or train averages 110 miles per day, the average speed being nine miles per hour, and the number of hours in daily operation being generally 18. The dividends paid to the stockholders have reached as high as 72 per cent., though the average on the whole of the roads is about 12 per cent. Cable stock continues to be a favorite investment, commanding a high position in the markets, but it is generally held so tightly as an investment as almost to exclude it from quotations. But from quotations to hand, West Chicago, North Chicago and the Chicago City roads are seen to be respectively at $625, $500 and $308, the par value of the stock being in each case $100.

Trial of American Heavy Armor Plates.

The trial of heavy armor plates of American manufacture mentioned in our issue of Oct. 9, was commenced last Saturday at the Indian Head Proving Grounds on the Potomac River below Washington, D. C. All the plates are 8 ft. × 6 ft. surface exposure by 10½ in. thick; three of them were attacked Saturday, one from Carnegie, Phipps & Co., of rolled, low-carbon, nickel steel, one from the Bethlehem Iron Co. of forged, high-carbon nickel steel, and a second from the Bethlehem Co. of Harvy treated forged steel. The 6-in. 40-calibre gun was mounted with its muzzle at a distance of 57 ft. 6 in. from the plates, the 8-in. 25-calibre gun was mounted with its muzzle 54 ft. 2 in. from the plates. The projectiles used for the 6-in. guns were of the Holtzer imported type, 17¼ in., weighing each 100 pounds. A charge of 42 pounds of Dupont prismatic powder was used for firing the projectiles. The projectile used for the 8-in. gun was of the Firminey make weighing 210 pounds and fired with a charge of 74.5 pounds of Dupont prismatic powder. The velocity of the shot from the 6-in. gun was 2,075 ft. per second, that from the 8-in. gun was 1,850 ft. per second. The results were as follows:

The Bethlehem, forged, high-carbon, nickel-steel plate was pierced at its upper left hand corner by the first shot, the projectile rebounding to a distance of 15 ft. without injury. The depth of penetration was some 13 in., fringed by a circular rise of about one inch in height. The width of bulge was 8 in. The second shot penetrated the upper right hand corner to a depth of 9.5 in. and broke up outside of the face of the plate; the fringe and bulge about the same as for first shot. The third shot penetrated the lower left hand corner to the same depth as the first (13 in.), rebounding from the hole some 15 ft., with the loss of its band. The fourth shot penetrated the lower right hand corner some 10¼ in., making a bulge 17 in. in width and producing two radial cracks some 3 to 4 in. long. The projectile rebounded with 9 in. of its length broken up. The fifth shot was fired from the 8-in. gun, at the centre of the plate. The projectile penetrated to a depth of 15⅛ in., rebounding to a distance of 54 ft. Two cracks were the result of this 8-in. shot, one radiating to the upper left hand corner and one to the lower left hand corner, each passing through the holes made by preceding 6-in. shots. The upper crack was serious and extended through the whole thickness of the plate. A third crack crossed the space between the centre 8-in. shot hole and the upper right hand 6-in. shot hole.

The first shot from the 6-in. gun at the rolled, low-carbon, nickel-steel plate of Carnegie, Phipps & Co. penetrated the upper left hand corner to a depth of 11¾ in., and remained in place with similar bulge and fringe to the Bethlehem plate. The second shot penetrated the upper right hand corner to a depth of 9 in. and remained in place, and in comparatively good condition, similar to the first shot. The third shot penetrated the lower left hand corner, leaving only about 2½ in. of the base of shot sticking out. The other results were about the same as with previous shots. The fourth shot penetrated to a depth of 13½ in., and remained in place under the same conditions as before. The fifth shot fired from the 8-in. gun, at the centre of the plate, entered the plate completely, the base of the projectile being some seven-eighths of an inch below the face of plate. A crack showed itself extending radially from the centre 8-in. hole to the upper, left hand corner, of plate, passing across the upper left hand 6-in. shot hole. The upper portion of this crack was much worse than that between the holes, though neither portion extended completely through the plate.

The first shot from the 6-in. gun at the Harvey, low-carbon, all-steel plate of the Bethlehem Iron Works penetrated the upper left hand corner about 7 in. and broke up, scattering the pieces in all directions. The second shot penetrated the upper right hand corner some 2¼ in. and broke up. A crack resulted from this shot, extending horizontally in an upward direction to the right hand edge of plate. The third shot penetrated the lower left corner to a depth of 9¾ in., and caused a crack running from the hole to the bottom edge of plate. The fourth shot penetrated the lower right hand corner about 12 in. without other damage. The fifth or central 8-in. shot penetrated to a depth of about 23 in., cracking the plate badly, one crack extending from the lower left hand corner up through the lower left hand, the centre and the upper right hand holes, to the upper right hand edge of plate; another extending from the lower right hand corner diagonally upward to the lower left hand shot hole, and thence to the lower left hand edge of plate.

A peculiar result of the firing at the Carnegie, rolled, low-carbon, nickel-steel plate presents itself; that while the projectiles penetrated to a considerable depth, and deeper than in other plates, each remained in place as a perfect fitting, tight plug. The cracking and breaking up of the Harvey, low-carbon, all-steel plate was quite unexpected. Whether this latter result arises from defective treatment in its manufacture or not, the ability of the low steel, rolled plate of Carnegie, Phipps & Co. to stand fire so well will necessitate a new trial with new plates to confirm this new and quite important experience. The crack in the low-carbon plate, although but slight, needs further experiment and explanation before a settled conclusion is arrived at. Again, a comparison of the cracks in the high-carbon plate and the Harvey process plate may possibly show exposed hardness to be a bad feature of thick plates. A reversal of the Harvey plate might have brought about quite different results. The question of rolling versus forging is probably a feature of the problem, or again, the necessities of defense in different positions on the vessel may call for different construction of plates. The hard surface material produced by the Harvey process may be the more useful for portions of a vessel likely to receive glancing instead of direct blows. There are still five more plates to be tried before final conclusions can be thought of.

The St. Mandé Collision.

Our Paris correspondent has sent us the following report of this collision, giving the facts as brought out at the trial before the "Correctional Tribunal." Testimony was given by experts who had made experiments with a train composed as nearly as possible like the one which caused the collision.

The accident is said to have been the most fearful known in France since the first day of railroads*, and the cause is attributed to two men. The driver, Caron, has been sentenced to two years imprisonment and a fine of 500 francs, and the substation master of Vincennes (Deguerois), to four months in prison with a fine of 300 francs.

On Sunday, July 26, an "omnibus" train of 24 carriages (of a sort having upper stories or compartments, and laden with passengers to the number of about 250, who were beneath and on top and on the stairways of the cars) was standing at the station of St. Mandé, on the Eastern of France, where it had been delayed three minutes beyond the time allowed, due partly to an altercation between the sub-station-master and three men who had placed themselves in a ladies' compartment.

No blame is attached to any one at this station, for the train was duly blocked behind the moment it appeared in sight of this station, according to the usual rules. The distance between this station and the preceding one, Vincennes, is so short (⅝ mile) that only one semaphore is needed, and this semaphore is at the station of Vincennes itself, consequently forming just one section, or block.

The electric semaphore operated from St. Mandé was in direct connection with that at the end of the platform at Vincennes, or about 75 metres in advance of the spot where the engine of the succeeding train had stopped.

These signal posts have a red arm at the top for day work and colored spectacles in front of the lamps for night. The act of raising the red arm at one station causes, by electric current, a small yellow arm to be raised from its position of half height, on the next post in the previous section [caution signal?] signifying the road in front of it is blocked. In connection with the same current there are disks which signal more particularly to the drivers to stop or to slacken speed.

But the blocking is not absolute, for after the expiration of five minutes from the arrival of the train it is allowable for the train dispatcher (sub-station-master) to send a train forward on to the blocked section on condition that the latter asks the driver the number of his engine and notifies him to advance with extreme caution in order to be able to stop in a few paces.

The circumstances initiating the collision were that the sub-station-master at Vincennes, finding this second train (No. 116 D) to be late, and that another one was advised from lower down, at Fontenay, gave the signal to go, although he knew that the disk signal operated from St. Mandé showed "line blocked." He did not look to see if the semaphore showed the red light, nor could he do so from his position on the platform; to do so he would have been obliged to run forward about 100 yards to see the signal, and then to return and speak to the driver. This would have required a delay of another two minutes. He left it to the driver to see the semaphore and act according to it.

At the same time he did not suppose the preceding train, No. 116, could have remained so long at the St. Mandé station, since he had had no indication by telegraph to that effect. Here it will be seen he was to blame, because had he warned the driver it is very possible that the latter would have gone with more caution.

The engine was the ordinary type of 8-wheel 6-coupled tank engine of the Eastern road, and had 16 carriages. The cab was in advance, but that did not prevent the driver seeing equally well as in going chimney first. The engines had the Westinghouse brake, and this was tried before leaving the station. The driver did not look forward to the semaphore, but simply awaited to hear the starting signal. He claims that the semaphore light showed red and the fireman supports him, but other testimony overwhelmingly disproves this. The driver then ran along at 20 to 25 miles an hour. It is believed that he closed his regulator at a spot where it is the custom to do so on account of a slight falling gradient into St. Mandé. He might have seen the tail lights of train No. 116 at a distance of 830 ft away. He presented a defense made up of a curious lot of improbable and impossible claims about his alleged efforts to stop, but they were all discredited, and it seems that he simply ran along without looking ahead.

It was at 9:21 p. m. the engine ran into the rear end of the stationary train (No. 116) smashing the conductor's car and the two next carriages. The engine mounted the wreck, and the firebox flames set fire to the splintered wood, burning to death people who were held down by the débris. Forty-eight people were killed or died afterward, and 180 were more or less seriously.

It might be remarked that on this line there are very many double story cars set low on iron frames, which are bent up at the ends to give the requisite height for the buffers, coupling chains, etc.; and it is probable that, in case of an engine colliding, many more carriages would be wrecked than ordinarily, for the want of a strong support directly behind the buffers to oppose the impact. This was a point not mentioned in the inquiry.

Specifications for Air Brake and Steam Hose.

In connection with the article on the wear of rubber which appears on another page, the following specification may be interesting. It is the attempt of one railroad company to buy hose intelligently. How far it is likely to be successful may be judged when one consid.

* The Versailles disaster, May 8, 1842, which was caused by a broken axle, resulted in the death of 52 persons.—EDITOR.

ers that the pressure endured is not a question of rubber but of the canvas.

3. All hose must be soft and pliable and carefully finished inside and out. Rubber forming inside of pipe to be firmly and completely joined at lap. Canvas to be separated by a distinct layer of rubber, firmly jointed to it.

4. Hose will be purchased in coils or cut to lengths. Where purchased in coils 51 ft. must be furnished for every 50 ordered, and one foot will be tested to bursting pressure given. Where hose is ordered cut to lengths, one extra piece must be furnished for every 50 ordered, and this extra length must be subjected to the bursting pressure.

5. Standard air brake hose must be used on cars and tenders with angle cocks and must be 22 in. long, 1 in. inside diameter, four ply, capped with rubber so as to exclude moisture, must have an extra ply for 4 in. from the end, and must stand a proof test of 300 lbs. per square inch, and a bursting pressure of 700 lbs. per square inch.

Standard steam service hose must be used on cars and rear of tenders and must be 34 in. long, 1½ in. inside diameter, four ply, must have the ends capped with rubber, must have one extra ply for 5 in. from the end, and must stand a proof test of 300 lbs. per square inch and a bursting pressure of 700 lbs. per square inch.

6. Hose must conform to dimensions and stand the following pressures:

Size Inches	Ply	Service	Proof pressure lbs. per sq. in.	Bursting pressure lbs. per sq. in.
½	3	Water	75	400
¾	3	"	75	400
1	4	Air brake	300	700
1	4	Steam	300	700
1½	4	"	300	700
2¼	4	Tank	100	450

German Notes on American Railroads.

(CONCLUDED FROM PAGE 741.)

We continue from our issue of Oct. 23 the extracts from the notes of Mr. von Borries on the railroads of the United States. To us the chief significance is in what strikes an intelligent German railroad officer as best worth talking to his countrymen about, in our practice.

The organization of the traffic department on the Pennsylvania system is described at length. Subdivision of all the work is arrived at, with the view to specializing and preventing the shifting of responsibility. The managers and division superintendents are, in part, technically educated men and, in other part, have risen from the ranks.

On the smaller roads the office of general manager generally falls to the lot of one of the vice-presidents and the subdivision of the management is simpler than that just outlined. In every case, however, the organization is based upon individual control and responsibility for the different departments.

TRANSPORTATION MANAGEMENT.

In this the underlying principle is to utilize the available plant in the most far-reaching manner, and to get a maximum of efficiency for a minimum of cost. It must not be concluded from this, however, that the plant is allowed to suffer inordinately from wear and tear, or that it is allowed to fall into a bad state of repair. On the contrary, good maintenance and constant improvement are strictly insisted upon. Every attempt, moreover, is made to secure a certain degree of automatic working in the whole system, and this again is favored by the careful method of classifying and subdividing the work. Each department is, in a measure, supposed to be independent of all others, and orders from the heads of one to the working force of another are not countenanced. The function of the train dispatcher is described at some length.

FREIGHT TRAIN SERVICE.

Freight trains are often made up of from 40 to 60 cars. Only express or fast and local freight trains run according to a regular time table. This is true also of what are called the first sections of through freight trains on single track lines. The other freight trains are dispatched according to the requirements of the service, and, on single track lines, follow the regularly scheduled trains as second, third or fourth sections. On double track lines the through freight trains are generally run regardless of any time table. This system, which, from the standpoint of economy, is of great importance, would be impossible without the train dispatcher's services on sections where there is no block system. As it is, even slight mistakes easily lead to collisions, and in order to secure that degree of safety made imperative on European lines, the block system is unquestionably necessary.

In Prussia, where the use of the block system is general, the introduction of heavy freight trains would entail little difficulty. The average freight train on the Prussian government roads is made up of only about 77 axles, though the locomotives now used could easily draw trains of 90 axles. Mr. von Borries decidedly opposes the stand latterly taken in many quarters to reduce instead of to increase the loads of freight trains. Such a reduction, he maintains, would reduce the efficiency of the service, owing to the necessarily increased number of trains and the increased costs of working.

In the past few years the speeds of American freight trains have been generally increased to secure better performances, and there has been no noticeable increase in the working expenses.

PASSENGER TRAIN SERVICE.

On the main lines express train service has been highly developed. The fast through trains are made up principally of the heavy Pullman or Wagner cars. The limited trains, on which only such cars are used, weigh from 300 tons upward. The speed of these heavy trains, therefore, notwithstanding the use of powerful locomotives, is not particularly high, and, on favorable sections of track does not average more than about 70 kilometres (about 43½ miles) per hour. . . . The prevailing tendency is to transport the greatest possible number of passengers in one train by using heavy and powerful locomotives. Economy in fast train service is largely dependent on this practice.

On some short sections it has been found necessary, for successful competition, to run light trains at very high rates of speed, and, as an example, Mr. von Borries cites the Baltimore-Washington section of the Baltimore & Ohio road.

Ordinary passenger trains, he continues, are generally much lighter than those referred to above, and, especially in the Eastern states, run at high speeds. Special importance is given to high speed in suburban traffic, since trains on suburban lines are largely patronized by business people to whom saving of time is valuable.

SWINGING TRUCKS AND QUICK-ACTING BRAKES.

Under this head Mr. von Borries says that with the exception of switching engines and two-axle coal cars, the entire rolling stock on American roads is fitted with swinging trucks. These have been found eminently satisfactory for accommodating themselves to curves, especially at high speeds, and curves of more than 300 metres (984 ft.) radius are, therefore, as a rule, passed with undiminished speed, frequently ranging as high as 80 and 90 kilometres (50 and 55 miles) per hour, without danger of derailment.

High speeds on down grades are also made possible by the use of Westinghouse brakes, which are used on all passenger locomotives and cars. Both these brakes and the swinging trucks are considered by Mr. von Borries as adding considerably to the satisfactory performances.

He calls attention also to the easy motion produced by the use of the bogie trucks and to the resulting saving of wear and tear on both rolling stock and permanent way. Incidentally, the trucks add to the comfort of the passengers. Mr. von Borries concludes that the general introduction of bogie trucks for passenger service cannot be too strongly recommended. He points out, however, that they must be simple and economical in cost of construction, as they are in the United States.

LOCOMOTIVE CONSTRUCTION.

Power and durability are among the first considerations in the design and construction of American locomotives. The heavy performances of the engines, in train miles run, furnish good proof of their excellence in point of construction, and are further sustained by the fact that they meet the exacting traffic requirements without necessitating unduly heavy repairs. Economy in fuel receives less attention than abroad, and is offset by other and more important advantages. In general, the exhaust nozzles are small in diameter, causing a strong draught and ample steam supply while doing the heaviest work. The sizes of engines are such that there is always available a properly proportioned locomotive for the growing requirements, particularly in heavy, fast passenger service. Double-headers are, as previously stated, used only on exceptionally heavy grades. Freight engines are designed with the view of hauling heavy loads at low cost, and on lines with heavy grades there are generally four or five pairs of coupled drivers.

All appliances calculated to aid the performances of the engines are unhesitatingly put to use, even though they add to the complication of parts and to the cost of maintenance. Nearly all freight and switching engines are fitted with driver brakes. Compound locomotives are receiving favorable consideration, and, on the completion of the trials now being conducted with them, will probably be more widely introduced.

The engine most widely used for passenger service is of the eight-wheel, four-coupled type. This engine, however, would seem to have reached the limit of its usefulness, owing to the growing opinion that its weight should not exceed 50 tons. For fast through train service, therefore, in which trains of as many as ten six-axle cars, weighing 40 tons, are to be hauled, the six-coupled, ten-wheelers, weighing from 55 to 60 tons, are already being used. These engines possess the further advantage of being serviceable for fast freight purposes. . . . Roads with exceptionally heavy grades use (for freight service) five-coupled, so-called "Decapod" engines, either with or without bogie truck. These engines weigh from 70 to 75 tons, but would appear to have passed the desirable limit in the number of coupled drivers.

Locomotives with radial axle drivers have not been built in America, says Mr. von Borries, owing to the opinion that the necessarily more complicated construction would impair their durability and lead to frequent breakdowns. This view seems to be strengthened by the experiences with the Fairlie locomotives in Mexico and South America.

For suburban traffic, locomotives of various makes, with from 4 to 5 axles, of which from 2 to 3 are coupled, are widely used. These engines generally weigh from 50 to 55 tons and have a large coal and water carrying capacity. Switching at the larger freight depots is generally performed by 3 coupled engines, weighing from 35 to 40 tons, and having a short wheel-base, without trucks.

Mr. von Borries further remarks that the mild steel fireboxes of American locomotives last, on an average, as long as the copper fire-boxes on German engines.

LOCOMOTIVE SERVICE.

Each locomotive is run by several crews—if possible, by two regular crews. It is only when this arrangement conflicts with economical management that groups of engines and crews to run them are formed. By this grouping, the performances of the locomotives are heightened, and on most American roads are double those attained on German roads. As an example, Mr. von Borries states that on the division between Altoona and Pittsburgh there were in the spring of 1891, 328 locomotives, of which 15 per cent. were undergoing repairs. For these engines there were 700 crews, of which 10 per cent. were absent. Steam was constantly kept up in these engines for eight days without intermission.

Having several crews for one engine, and keeping the latter almost constantly in service, Mr. von Borries considers as another important item in the matter of economy. It makes a smaller invested capital necessary for locomotives and locomotive sheds, and prevents accumulation of locomotives of antiquated designs, since the existing engines are worn out in reasonable periods of time and are then replaced by new ones, better suited to the more modern requirements.

PASSENGER SERVICE.

Passengers choose seats for themselves and have no difficulty in finding accommodations, since they can pass from one car to another of the same train even when it is in motion. There is no waiting for belated travelers and the trains start promptly on time. The fact that the passengers choose the seats for themselves relieves the train officials of much unnecessary work with which they are burdened on German lines, on which they must, on request, usher passengers to compartments. This consumes much time, especially when the traffic is heavy and passengers are critical in the matter of accommodation, and, as a consequence, trains are belated and annoyance generally is caused. To obviate this, there is a tendency on German lines to provide an unnecessarily large number of cars, with the natural result of inefficient utilization of the seating capacity, only 25 per cent. of the number of seats generally being occupied. Justified complaints of overcrowding are made only in few cases, and then generally refer to days on which the traffic was specially heavy.

Mr. von Borries is in favor of the American type of cars, stating that, besides the advantages already implied, it is only in such cars that heating and ventilating can be perfectly effected. One readily becomes accustomed to the one large compartment, though special compartments could be provided for long-distance passengers; and entrance and exit of the passengers is easily effected. He is of the opinion that the German traveling public may be expected to be just as well able to find their seats in a railroad train as the American public, and if they were compelled to do so it would be the means of making them more self-reliant.

CONSTRUCTION AND USE OF FREIGHT CARS.

American freight cars, with the exception of some of the older two-axle coal cars are all provided with bogie trucks. Their capacity ranges from 50,000 to 60,000 lbs., and their dead weight amounts to about half their carrying capacity.

Two-axle cars, with wheel bases of four metres (about 13 ft), offer advantages in passing sharp curves, with radii as short as 40 metres (131.2 ft.). Their cost of maintenance, compared with their carrying capacity, is appreciably lower than that of the four-axle cars, and the advantages of the latter are found only in the saving of brakemen's wages and in switching. From this it follows that the use of bogie trucks for freight cars is of no special advantage. On the other hand, Mr. von Borries points out that the construction of the American freight car is, in the main, so simple, that an open platform car, for example, with a carrying capacity of from 50,000 to 60,000 lbs., with axles and wheels, costs only from about $550 to $600. All the principal parts are of wood, and are made in quantity by special machinery. The wheels are of cast iron with chilled wearing surface. Special durability of the cars is not aimed at, the opinion being that after a lapse of from 15 to 20 years cars of a different design will probably be desirable and that then the comparatively low first cost of the old cars will warrant their abandonment for new ones.

Mr. von Borries remarks that German railroads would find it profitable to simplify the construction of their freight cars, and to follow the American plan of turning out the various parts according to fixed patterns, and thus cheapen their cost.

In conclusion, Mr. von Borries briefly directs attention to the coal and ore cars used in the United States, of the hopper type, enabling rapid unloading from suitably located trestles. These hopper cars he considers superior to dump cars, and suggests the advisability of studying their advantages with the view of adopting them on German lines.

Grain Elevator at Galveston.

The Galveston Wharf Co. has contracted with Stewart & Co., of St. Louis, for the construction of a grain elevator, to have a capacity of a million bushels. It will cost about $200,000, and is to be built within the next six months. The dimensions of the building will be 80 × 287 ft., and 14 cars will be unloaded at a time. The building is to be 152 ft. high, and contain 158 bins.

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Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

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The census bulletins on transportation show that during the 10 years from 1880 to 1889 the average rates received on the New England railroads decreased almost continuously every year, falling from 1.842 cents per ton-mile in 1880 to 1.470 in 1889, and from 2.188 cents per passenger-mile to 1.920. The average New England freight rate remains high, but it does not follow that, actually, rates for any given service are higher there than in many other districts where the *average* rates are much lower. New England has no great coal and iron mines and no great production of grain, etc., which will move only at very low rates, and which form an enormous proportion of the traffic of the Middle States. Thus, though New England is a thickly populated country and very active industrially, it has a comparatively light freight traffic, equal in 1889 to a movement of 459 tons each way daily over its entire mileage, against 1,699 tons in the Middle States, the passenger movement being equal to 308 each way daily in New England against 242 in the Middle States. The immense bulk of coarse freights in the Middle States, together with the vast movement of Western produce to the seaboard, a comparatively small part of which reaches New England, brings down the average rate in the former states, where also, doubtless, merchandise and local freights are carried at somewhat lower rates than in New England. In the Middle States there was a similar reduction in rates, but not so continuously, the lowest freight rate having been reached in 1885, when the West Shore was made to see the error of its ways, after which there was a slight recovery. The average was 1.044 cents in 1880, 0.804 in 1885 and in the successive years since 0.819, 0.827, 0.816, 0.803. The fall in 10 years has been 22½ per cent., against 20½ per cent. in New England. Passenger rates are nearly the same in both districts, and have fallen about to the same extent —from 2.188 cents per mile to 1.920 in New England and from 2.232 cents in the Middle States to 1.995.

"The Wizard" and the Locomotive.

Mr. Edison's gifts as a humorist are famous; but his recent "grind" on a reporter of the New York *Herald*, while not so audacious or elaborate as some of his earlier jokes, will add to his celebrity. Perhaps it was all the more successful because of the studied self restraint with which Mr. Edison kept within what the *Herald* man thought were the limits of probability. At any rate the joke "caught on," and has had a tremendous newspaper success. In fact it has been taken seriously by several editors whose knowledge of physical science ought to have made up for a defective sense of humor. Some have suspected that it was the purpose of "the Wizard," or at least of the reporter, to interrupt the progress of the other electric railroad supply companies, which have apparently been taking the lead in furnishing electric equipment, and to give time to the Edison company to catch up. But this view is based upon an exaggerated notion of the power of clap-trap. We are quite confident that sometimes the Wizard amuses himself in sounding the depths of human credulity, and that this was one of the times. This masterpiece of humor appeard in the *Herald* of Oct. 25 and may be briefly summed up thus:

Electricity will displace steam on railroads if economy, speed and safety are factors in locomotion; not because it will make easily a speed of 100 miles an hour while steam "strains itself to make sixty"; but because it will get one horse power out of one or two pounds of cheap coal, while out of six pounds of high priced coal a locomotive can get only the same one horse power. The current will pass from the stationary engine to a central rail between the tracks, and will be collected by the motor. Each passenger car will carry its own motor, but freight cars will need one large motor at the head of the train. The current will be supplied from a power house, three of which with a horse power of 10,000 to 12,000 each would run the whole Pennsylvania railroad between New York & Philadelphia. This system will be in operation soon between Chicago and Milwaukee, and trains of two cars will be run every twenty minutes. Gradually the locomotive will be abandoned for electricity.

We cannot reproduce the "laughs, not contemptuous'" and the "deprecatory, apologetic smiles," and the "Wizard's flights into the realms of hyperbole" and the picture of him in his working clothes; but this short synopsis gives the unclothed skeleton of his last joke.

We do not understand that Mr. Edison claims to have invented any new kind of electricity. His invention, which is being patented in Europe and elsewhere, must necessarily relate to details of construction and not to the principles involved, which are older than the hills. He expects to use a current of low potential, less than 100 volts, with some new form of collector which will work in any sort of bad weather, slush or snow, or even under water. He will use, of necsssity, a large conductor to carry the large volume of current which is needed to transmit any considerable power when the potential of the current is low. The advantages of low potential currents were pointed out years ago; the principal one is the reduced cost of insulation. For the sake of the argument and to see the value of the statements made, let us admit that Mr. Edison's devices and inventions will permit the use of a low potential current and a minimum insulation, and consider a few of the working conditions.

The only motor which is acknowledged to be of any value for this class of work is the series motor, of which the efficiency varies from zero to 90 per cent. Not more than 50 per cent. can be taken as a fair average for working conditions. Condensing engines cannot generally be had for producing the current in a stationary plant; triple expansion, non-condensing engines may be used, which will when connected with good boilers generate 1 H. P. for one hour from about 2½ lbs. of cheap coal, such as is used on locomotives in the West. With 50 per cent. efficiency—which is as high as may be granted for an electric motor working under the variable conditions of railroad service—and a reasonable loss from leakageon the line, the coal per horsepower on the motor would be 5½ lbs. per hour. This is not more economical than the compound locomotive or the best of the simple engines now being used. Without making any allowance for losses in generating the current in the central station, which may be anything from 5 to 25 per cent., one can see that the introduction of electricity as a motive power to supplant the steam locomotive using common coal is not necessarily an economical step. Where anthracite coal is used, as for elevated roads in cities, an economy of 25 per cent. in fuel for the electric motor can be shown by calculation.

So much for the economy; but how about the capacity of the electric motor? Who can point out a single instance where a 100-H. P. motor has been constructed? Yet what is needed for steam railroad work is 800-H. P. motors at the least, and these for various reasons must be placed at the head of a train. It is folly to talk of sub-dividing motors for train work. We have been years perfecting the four and six-wheel passenger trucks to make them ride easily at high speeds. We should like to see the inventor who can look at one of them and tell us where, on those trucks, he can put a motor of sufficient capacity and leave to the truck all of the admirable features it now has. Within the limits of the truck frame the space is now crowded with brakebeams, levers, swing bolsters, springs, equalizers, and safety straps for axles. Besides this, the application of a motor to a truck powerful enough to do the work required would impose such increased loading upon the axles, springs and wheels, as to require the strengthening of all the framing of the truck and the transoms of the car. The trucks are so heavy now that during a sudden application of the brakes there is a severe strain imposed on the framing of the truck and its connection to the car body. Those who propose to mount the motors directly on the axles show their lack of knowledge of the difficulties already found in the maintenance of wheels and axles within limits of safety. All who have seen an electric motor as used on street cars know that the necessary machinery, such as gears, commutators, brushes and insulation, is so great in amount as to render a duplication of it for every car in the train impracticable beyond question. In washing cars and trucks the insulation of motors would be damaged, and car shops would have to be provided with tools and pits for the removal and repairs of electric motors. Who will say that the electric motor is so far perfected that it can be removed from the sight of an attendant and placed in an inaccessible position under a passenger train to be moved at a high rate of speed? Is it reasonable, in view of the troubles we already have to keep free from hot journals with only eight journals per car to care for, to add at least eight more, and these additional journals of a type difficult to keep cool? They cannot be provided with sponge boxes, but are solid bearings completely encircling the shafts and have to be fed by automatic oilers. But there are many other reasons for believing that a sub-divided motor is impracticable for railroad trains.

The proposition is to run two cars to a train. This proposition opens up a big field for discussion. First there is the difficulty of securing safety in running four or five times as many high speed trains as are now run on any given track, even if they are reduced to two cars each. Then the cost of running the same number of cars would certainly be increased. Moreover, what is to be done for dining, sleeping, smoking and parlor cars? There would have to be an entirely new basis of classification of passengers.

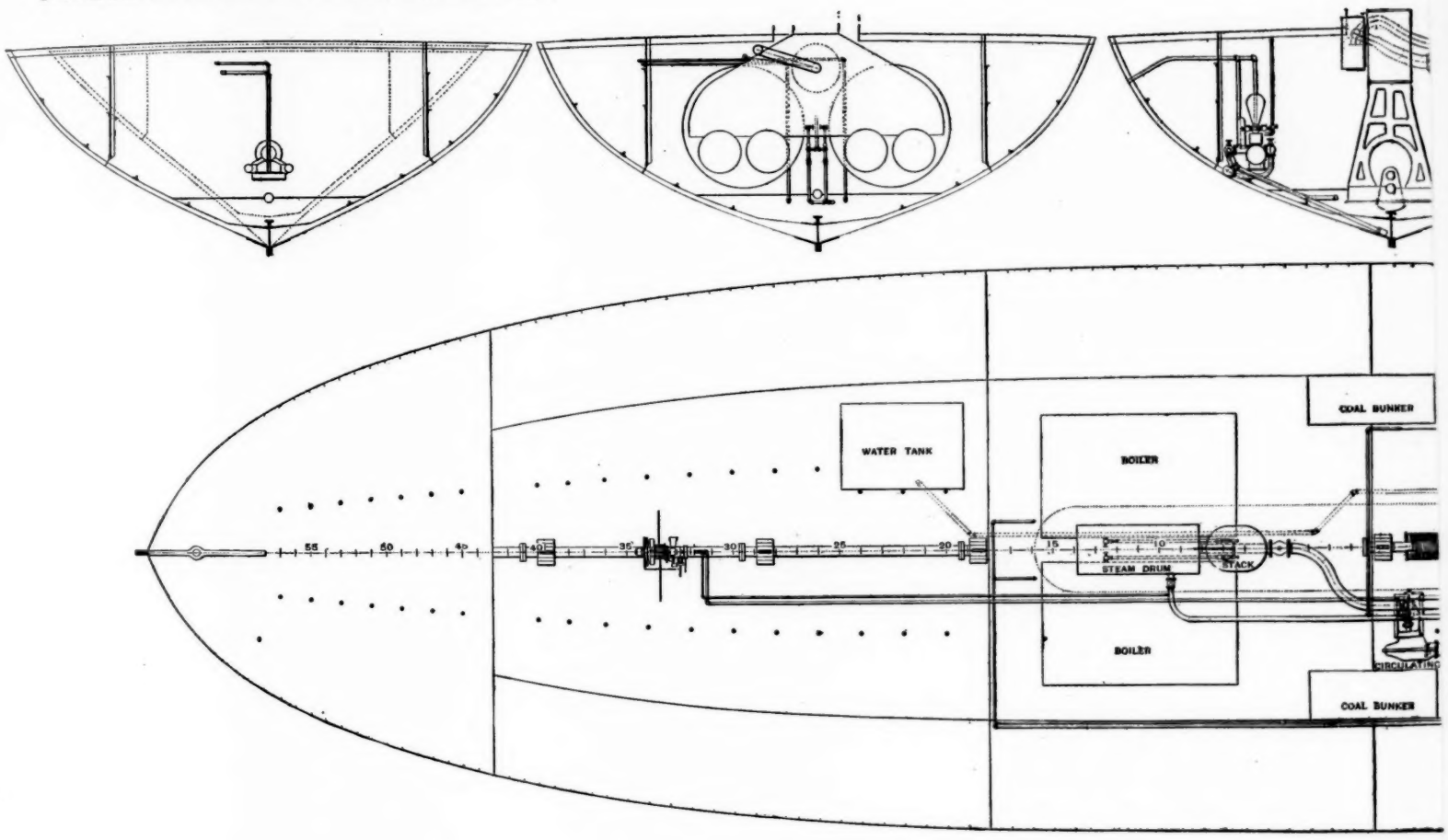
But if we give up the idea of two car trains and retain the present economical and comfortable arrangement of heavy trains, with a variety of cars and a minimum working crew these trains must have 800-H. P. motors, which must be put at the head of the train, for three reasons: There is no room and it is mechanically impracticable to put motors on the trucks of passenger cars, or freight cars either, for that matter. Second, a single large motor is more economical than several small motors producing the same amount of power. Third, there is less dead weight per train with one large motor than with several small ones. Here are reasons enough to settle the size and position of electric motors on trunk line trains for all time, or at least until they are "as simple as a grindstone," as was claimed for them by an enthusiastic engineer who recently urged their use on all axles in a train.

Mr. Edison is made to say that three central stations of 10,000 to 12,000 H. P. each would be sufficient to run the trains on the Pennsylvania Railroad between New York and Philadelphia. We have no precise estimate of the total horse power being developed at any one instant of time by the locomotives on the Pennsylvania road between Jersey City and Philadelphia; but assuming 35 passenger engines and 90 to 100 freight and shifting engines at work at one time the horse power developed may safely be taken at 70,000. Allowing but 30 per cent. for leakage and other waste, each of Mr. Edison's three stations must generate at least 30,000 H. P. This must be transmitted 15 miles each way from the station. The size of the conductors to carry this power, at less than 100 volts potential, for 15 miles, would surprise the *Herald* reporter more than any of the Wizard's statements did.

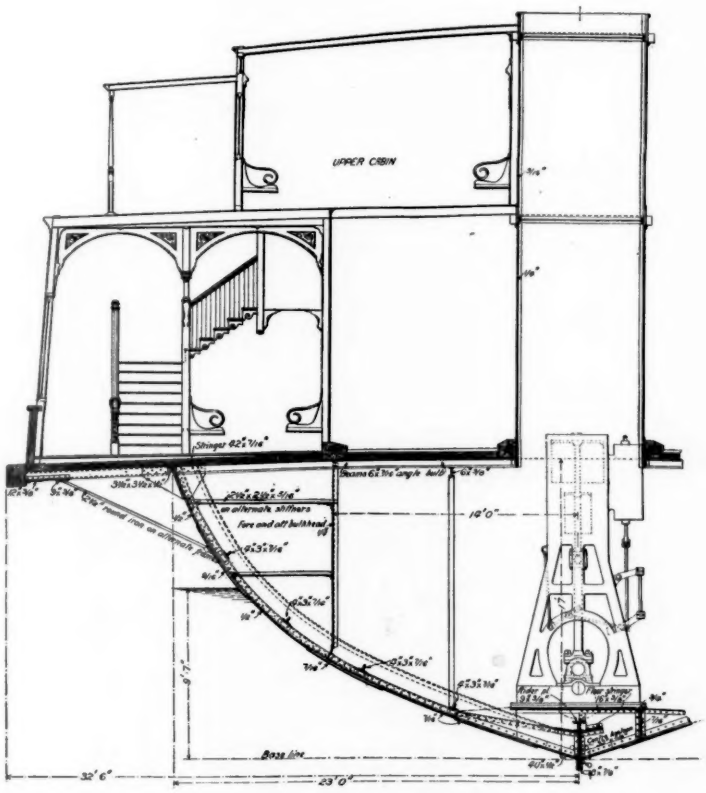
But supposing it to be a practical thing to run a trunk line with electric motors, as far as the mechanical features of the conductors and motors are concerned. Then comes in the question of moving trains in cases of accident where the conductors are broken, as they would be in wash-outs and wrecks. For example, three central stations between New York and Philadelphia would leave long lengths of track wholly without power in the case of an interruption in the circuit, unless large copper feeders, well buried in the ground, out of harm's way were provided, at enormous cost. To prevent serious delays, all of the stationary engine plant would have to be duplicated, and the whole proposition runs into such vast sums when correct estimates are made that we do not see the possibility of a saving which would pay a reasonable percentage on the additional money invested.

An electric motor will cost as much as a locomotive when of equal power. The cost of repairs to electric motors and the stationery plants and conductors would be considerably greater than the cost of repairs to locomotives. Each must have its brake apparatus; its wheels, axles and boxes; its trimmings and fittings. What would be saved in boiler repairs and repairs to the tenders for locomotives would be more than lo in repairing the stationery plant and the conductors

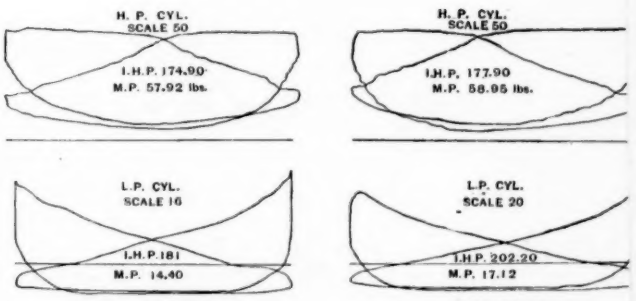
Finally, we would discourage no honest effort to



General Arrangement of



Transverse Section Amidships.

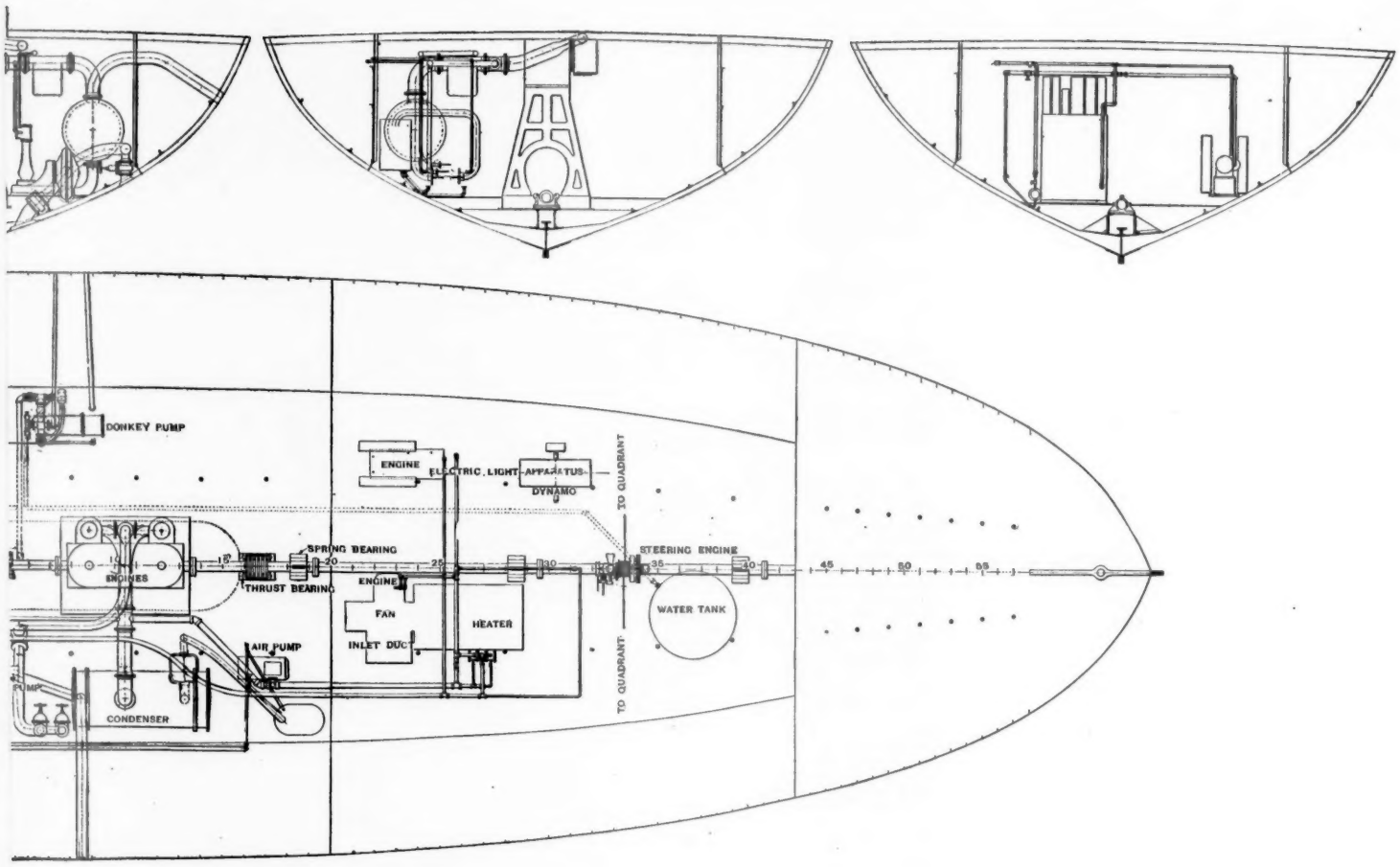


Forward Engine. *After Engine.*

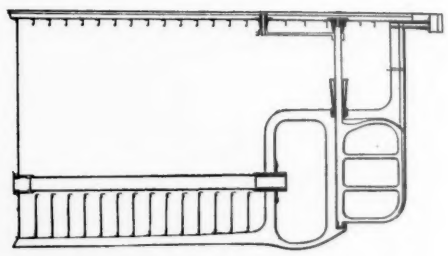
Cards from Engines of the "Cincinnati,"

Steam, 105 lbs. Vacuum, 24.3 in. Revolutions, 94. I. H. P., 736.

THE PENNSYLVANIA RAILROAD COMPANY

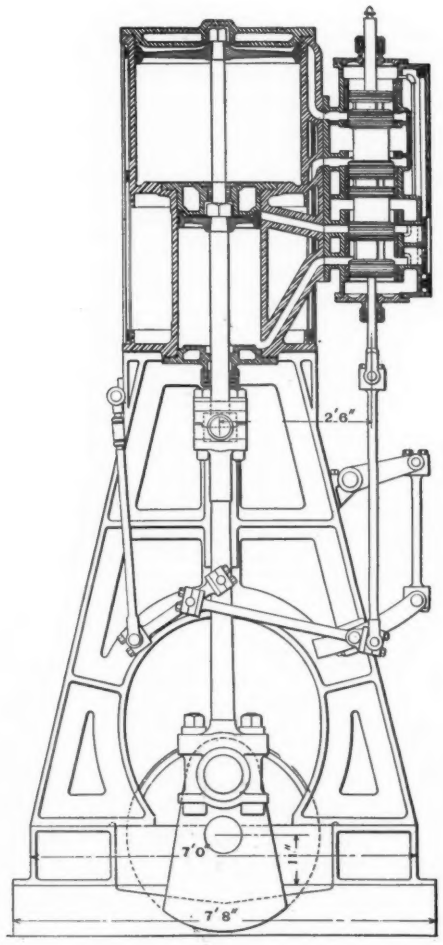


Machinery.



Longitudinal Sectional Elevation of One End.

"S DOUBLE DECK, SCREW FERRY-BOAT "CINCINNATI."



Main Engine.

vance the use of an electric current for trunk line railroads. It is a possible thing to do, but such wild statements and estimates as some one has attributed to Mr. Edison do more harm than good. Very likely an electric motor can be made to do the work that is now being done by steam locomotives and this with reasonable economy. Just what the comparative efficiency of the two systems of propulsion would be, no one can say. It will undoubtedly depend largely upon the relative cost of the fuel used in the stationary engine and the locomotive, and upon the concentration of trains. A short line with frequent trains is a better field for the electric motor than a trunk line between Chicago and Milwaukee. This leads naturally to the notion that elevated railroad service is best adapted for using electric motors to advantage. Now, setting aside the failure of all attempts to use electricity on the New York elevated as proving nothing because they were premature and improperly carried out, and even going so far as to consider the recent attempt in a London subway to be a success for light trains, and granting to electricians every reasonable claim that they make, let us look at some of the chances that have been neglected by the electrical companies in this country, and more particularly by Mr. Edison, to show what they can do for the elevated service.

A standing offer has been before them and the electric companies of Europe for a whole year to equip one of the new elevated roads in Chicago with a system for the electric propulsion of trains. Every possible condition is favorable for electrical work. The whole structure is open for the attachment of conductors; insulation is easy; the train work is regular, the distances are short, the loads to be carried are light, and yet under all these favorable conditions not one of the electric companies is ready to come forward and say that it will undertake the work and guarantee performance. The more one reviews the conditions existing in Chicago, such as cheap fuel, water for condensation in the stationary engine, a superior structure, a short line and light trains, the less confidence one has that the inventing electricians and promoters believe or would be willing to stand by their own statements. The largest motor now running on a car in this country is less than 50 H. P., as far as we can learn (the City & South London motors are designed for 100 H. P.). It is a big jump from this to 800 H. P.

Census Railroad Statistics.

The statistics of transportation of the Census of 1890 are in charge of Prof. Henry C. Adams, who is also Statistician of the Inter-state Commerce Commission, and as such has had experience in gathering and presenting railroad statistics. We have had in this country a multiplicity of railroad statistics, such as they were. Until the creation of the Inter state Commission Poor's Manual gave, in its aggregates of corporation reports, the only body of national railroad statistics: but the separate states, one of them for as many as 35 years, but most only since the establishment of their state railroad commissions, have published what purported to be state statistics, but were actually, for the most part, very different, including often thousands of miles of mileage outside of the states reporting.

In Illinois, for instance, the Michigan Central, the Chicago & Grand Trunk, the Lake Shore, the Pittsburgh, Fort Wayne & Chicago, the Pittsburgh, Cincinnati & St. Louis, the Baltimore & Ohio and other lines to the east, with perhaps only 20 miles of road in the State of Illinois, reported for their entire lines, perhaps of one or two thousand miles in extent; the Wabash gave figures for a great system in Indiana, Ohio, Michigan, Missouri and Iowa, in connection with those of its numerous Illinois lines; while most of the great lines from Chicago westward—the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago & Alton—reported for a mileage north and west of Illinois which in many cases was much greater and in some several times greater than their Illinois mileage. In New York, the Boston & Albany and the New York, New Haven & Hartford, with a few miles in that state and a great many further east, and the Lake Shore & Michigan Southern and the New York, Pennsylvania & Ohio, all but a small part of whose mileage is west of New York, swell the aggregate of that state with figures which belong chiefly to other states. And so generally, the so-called state railroad statistics are not what they purport to be, and it is impracticable to confine them strictly to the railroad mileage within the several states. This, however, is no great misfortune. There is practically no use for statistics strictly confined to the several states. An attempt to secure them could scarcely result in anything more than the employment of an additional small army of computers and shrewd guessers in the accounting offices of the railroad companies.

Shall we then have no general railroad statistics other than those for the whole of this vast country, nearly as large as all Europe, and with a much greater railroad mileage? We do not say that this would be an insufferable condition of things; for (not to say that we have suffered it and survived, so far) probably ninety-nine one-hundredths or more of the use of railroad statistics is had from reports from the several lines; and immensely greater advantage, we imagine, is to be had from individualizing than from generalizing railroad statistics—by reporting them for each separate line and branch of a single company than from aggregating them for a large number of companies in a definite territory. Perhaps the most useful railroad statistics ever published in this country were those which Mr. Albert Fink devised and published in the Louisville & Nashville annual reports beginning some 20 years ago, and which, we regret to see, are not given in the report for the last year, recently published. These reports gave unquestionable evidence of the very great difference that may exist in expenses, etc., between different lines in the same territory and under identical management, and have thrown a flood of light on many important traffic questions.

But it is at least interesting to have statistics for large territorial railroad groups in this country more exact than the state reports afford. It was hardly to be expected that they could be secured without too great labor; for to obtain them figures must be had for parts of systems. Earnings, expenses, traffic, etc., must be recorded (or estimated) for fractions of lines. With a rational division of the territory of the country, however, the obstacle to a reasonably accurate report need not be nearly so great as to one for the exact mileage within one ordinary state.

Professor Adams has divided the country, or rather the railroad system, into ten territories, for each of which Mr. W. W. Mayberry, Special Agent of the Census Bureau for this work, has collected certain statistics chiefly mileage, rolling stock, service, traffic, earnings and expenses—for *each* of the ten years from 1880 to 1889; and bulletins reporting the results have been published for two groups, the New England States, and the Middle Atlantic States, the latter including New York, New Jersey, Pennsylvania, Delaware, Maryland and part of West Virginia. In the first bulletin it is said that in forming the territorial groups boundary lines have been made to conform as nearly as possible to the terminals of the operating systems; and while a few exceptions were allowed, we are told that no deviation was found necessary in the New England group: which makes us wonder whether the figures for the New York ends of the New York, New Haven & Hartford and the Boston & Albany were separated from the totals of those railroads, and if so, how. In Group II. the western boundary was well indicated by what are known as the western termini of the Eastern trunk lines—Buffalo, Salamanca, Pittsburgh, down the Ohio to Bellaire and thence eastward to the southwestern corner of Maryland and down the Potomac, so as to include the main line of the Baltimore & Ohio—a much more rational boundary than one following state lines, even if the figures could have been obtained for the latter.

These two groups, with the one next west of them, cover the great industrial territory of the United States, and include the lines of heaviest traffic and earnings, and those which compare best with the railroad systems of the chief European countries. It must be remembered, however, that in these territories as well as further west and south, there are many railroads with light traffic and earnings, and considerable districts very thinly peopled and with few industries; as Northern New York, and a very large part of Maine and New Hampshire—veritable wildernesses, such as can be found nowhere in such "western" states as Illinois and Iowa. The first bulletin gives as a reason for reporting statistics for sections of the country that "averages cannot be safely used unless the figures from which they are derived refer to conditions which are fairly congruous," as if "conditions were fairly congruous" generally within the territory of each of these groups; which is very far from being the case. The "conditions" of the Ulster & Delaware Railroad, for instance, are about as different from those of its neighbor, the Hudson River line of the New York Central, as those of the worst situated railroad in Illinois from the best situated in the Union.

The bulletins have eight tables. The first is for mileage, and this we confess not to be entirely intelligible to an intelligence which has had little more than twenty years experience in studying railroad statistics; perhaps more experienced students will not have the same difficulty. The first figures are for "Length of line, single track." "Line" in England means what we call "track." In this country we distinguish one "line" of a company from another, and speak of the "New York Central line," the "Erie line;" and if the bulletin said simply "miles of line," we should interpret it to mean what we usually indicate by "miles of road," or "miles of railroad," to wit: the length of routes over which traffic is hauled, whether such routes or lines have a single, double or quadruple track, and excluding sidings. We suspect that this is what the census bulletins mean; first, because that is what we should expect to be reported when no other mileage of track is reported, and next because the aggregates of the mileage of road of the several states included in each group, as reported elsewhere, is more nearly equal to the bulletin figures than the aggregates of mileage of track. Yet it still seems to us that the words "mileage of line, single track," does not of itself indicate length of railroad, and may puzzle others besides the *Railroad Gazette*, which it did honestly puzzle, and led us to make references to other statistics, which after all did not quite set the meaning clear.

This mileage table gives the length owned by the operating companies, the length leased or otherwise controlled by them, and the length which they work under trackage rights—and which is also worked by some other company, so that the aggregate of the mileage operated is greater (in New England by 87 miles, in the Middle States by 310 miles), than the total mileage existing in the territory. There are no statistics of second track and sidings, which for many purposes are important.

The second table gives rolling stock and stations. Engines are classed as "freight," "passenger" and "switching," though there must be many cases where an engine is not confined to a single one of these services. The number of each kind of passenger-train cars and freight cars is given, as also of "cars contributed to fast freight service." The criticism we have to offer here is one that applies equally to all, or nearly all, equipment statistics. Some 15 years ago cars were so nearly alike in capacity that the stock of one railroad might well enough be compared with that of another. The only notable exception was the considerable stock of four-wheeled coal cars on some Eastern railroads, which were generally reported at their equivalents in eight-wheeled cars. But perhaps the most important fact in the railroad history of the past 10 years has been the increase in the capacity of the freight cars. Until about 1875, the capacity of an eight-wheeled freight car was almost universally 10 tons. Now for several years few cars have been built of less than 20 tons capacity: there are a great many 30-ton cars, and some still larger ones. This change ought to be statistically recorded. It is evident that the increase in the number of freight cars in the Middle States from 212,276 in 1880 to 334,155 in 1889 represents very inadequately the increase in the aggregate freight-car capacity. At the risk of the displeasure of those who are tired of answering the numerous calls for statistics, we venture to ask this in addition: the number of freight cars of each different capacity, or the aggregate capacity of the entire freight car stock. And the same is needed for locomotives, where the change has been quite as striking, and has been more effective in reducing the cost of transportation; but it will probably be more difficult to obtain, and also difficult to report, without setting up some common measure of locomotive capacity, such as does not now exist, in the absence of which the aggregate weight of locomotives might serve as an imperfect substitute. There are probably some important railroads in Group II. (Middle States) on which the average capacity of the locomotives is 50 per cent. greater now than it was 10 years ago, and therefore the increase in the number of locomotives from 5,517 to 8,129, or 47 per cent., represents but a part of the increase in the motive power on the Middle States railroads; nor does the increase of 33 per cent. in the number of New England locomotives; though in New England the use and the need of heavy locomotives is probably not so great as west of the Hudson River.

Table III. of the bulletins gives the number of employés under the four heads of "maintenance of way and structure," "maintenance of equipment," "conducting transportation," and "general administration." "Business done" is the subject of Table IV.—number of tons of freight and ton-miles, number of passenger journeys and passenger-miles, and train miles—passenger, freight and "other." Table V. gives passenger, freight and other earnings, and income from sources other than operation, and Table VI. gives expenditures, including, besides working expenses, interest on funded debt, rentals, taxes and dividends. Table VII. gives the working expense

under the four heads mentioned in the table for employés—all these, be it remembered, for each of the ten years ending with 1889.

The bulletins are prefaced by some deductions from the tabular statistics. With statistics for New England a statement is made of the number of engines of each kind, and of freight and passenger cars per 100 miles of railroad, of tons and ton-miles per freight engine, and of passengers and passenger-miles per passenger engine, and of the number of freight cars per million tons (not ton-miles) of freight carried, and the number of passenger cars per million passengers carried. It seems extraordinary that any one who has reflected at all on the subject should suppose that there can be any value whatever in the statement of the number of tons or of passengers (irrespective of distance hauled) per locomotive. And the statement of cars per million of passengers or tons of freight is equally meaningless. The inclusion of the length of haul is essential in all transportation statistics. The table shows, for instance, that there were 36 passenger cars in New England for every million of passengers carried, and 54 in the whole United States. And we may add that there were less than five on the New York elevated railroads. No possible use can be made of such figures. The really significant figures—ton-miles and passenger-miles are also given in the bulletin for locomotive service, but not for cars. Ton-miles per freight car and passenger-miles per passenger car indicate truly what service the rolling stock performed; and these we compute from the bulletin tables to have been as follows:

	New England.	Middle States.	U. S.
Ton-miles per freight car.....	47,076	69,115	81,107
Pass. miles per pass. car.....	499,385	494,362	452,148

The best way of presenting statistics of railroad service is to give the work done for a unit of time and of distance small enough to be readily comprehended by the mind. If we say that on the 18,620 miles of railroad in the Middle States freight trains ran 104 millions of miles in 1889, and the freight traffic amounted to 23,095 millions of ton-miles, no one, not even those most familiar with transportation statistics, can have any idea how dense the traffic was. If now we give the train mileage and ton mileage per mile of road, and say there were 3,760 passenger-train miles and 5,567 freight-train miles per mile of road during the year, and 176,903 passenger miles and 1,240,337 ton-miles, we have accurate *measures* of the density of traffic, and when the figures are given alongside of those of other railroads or systems we can compare them readily. But if we go one step further, and divide the train service and traffic per mile per year by 730, which will give us the *average movement each way daily*, which is in this case 5.15 passenger and 7.62 freight trains, 242 passengers and 1,699 tons of freight, we have the same exactness, and figures which are comprehensible at once by every one. They convey meaning standing by themselves and without comparisons, and at the same time facilitate comparisons. The big figures, we may say, are merely raw materials, which enable us to manufacture comprehensible and serviceable statements like the above.

Need of Data on Wear of Rubber.

Without entering the contest between rival claimants to the honor of discovering the vulcanization of rubber, it is interesting to record the story of Nathaniel M. Hayward's first struggles after a solution of this problem. In default of scientific knowledge, he was forced to trust to luck. His first compound was a curious mixture of ingredients, which by merest chance contained a piece of roll sulphur. The product surpassed his highest anticipations. It was firm, elastic, and no longer became sticky when exposed to the heat of the sun. But, as it happened, he had forgotten a portion of his experimental recipe; the sulphur was omitted, and the second batch was a failure. A dream, however, prompted his treacherous memory, and restored the precious secret. Such is the romance, and, whether true or not, it illustrates the character of a large part of the work which has been done during the past fifty years in the development of the rubber industry.

The experimenters have not been men of science, and they have not followed scientific methods. They have, however, been men of sound common sense, possessed of a fair amount of general information, which they have known how to apply advantageously, and they have accomplished really wonderful things. Yet the progress in rubber manufacture has been due in large measure to a series of clever guesses. Even to-day there is but a single rubber manufacturer in America who employs a chemist. While there is a certain uniformity in the processes of manufacture, there is also a most astonishing variation in the details of treatment, and in the recipes in vogue in the different factories for the production of what purport to be similar grades of rubber goods. These special processes are in the majority of cases guarded with extreme jealousy as "trade secrets." The possession of "secrets" in most branches of manufacture is a specious pretense, a piece of ludicrous folly, but the rubber business has not yet emerged from its middle ages of cryptographic mysteries into its period of scientific development. There is not in existence a treatise on rubber manufacture which gives formulæ for compounds, and descriptions of processes, by which goods can be manufactured equal to those now on the market, and the writing of such a book at present would be an impossibility. Even the best superintendents of rubber factories merely know those processes with which they have chanced to come in contact. They still remain in ignorance of a mass of information which can be obtained only by actual experience in all the leading factories in the country. The chemistry of rubber has been very imperfectly studied, and its physical properties have been made the subject of thorough research by only one American physicist, and even he has done scarcely more than indicate a number of wonderful characteristics, each of which is deserving of special investigation.

On the practical side, the consumer of rubber is continually the victim of the tradesman's desire to sell. If he finds an article that serves his purpose well he naturally persists in the use of that brand, but he can not be sure that it is the best that could be found. The fact is, a very little difference in the curing temperature, or in the amounts of the various adulterants, affects the value of the rubber for specific uses, rendering it good for some, and bad for others. In the case of rubber hose connections for steam heating apparatus, for instance, the purer the rubber the greater is its tendency to become spongy. Sometimes the "lining" will sponge up and almost close the pipe before the "friction" and "cover" are affected. The introduction of certain adulterants will entirely remove this trouble, and give the hose a long life, while other adulterants will cause the rubber, under the influence of the steam, to lose its elasticity, grow hard, and crack. The usual tests of a sample will not show how the hose will behave under long continued use. Nothing short of a comparative study of the effects of service upon rubbers of different manufacture can determine such a question.

So of air brake hose; it is the one item of brake equipment on which intelligent judgment cannot be used. It would be worth a great deal of money to buyers of air brake hose to know how the *best* could be selected from among the samples offered; but the makers themselves could not furnish tests that would be conclusive. So all that one can do is to buy of the maker who gives him good satisfaction and has a valuable reputation. It would of course be well to know the compounds and the treatment employed in each case, and in time, when rubber manufacture has become a science in the sense that the metallurgy of iron and steel is a science, this *will* be known, to the benefit of both consumers and manufacturers, but at present *data* as to the wear of rubber in its various applications must of necessity refer simply to the manufacturers' brands, although the virtues of some adulterants can be ascertained definitely.

Considering the innumerable uses of rubber in the mechanic arts it would certainly seem a wise step for some of our engineering societies to appoint committees for the purpose of collecting *data* regarding the wear, and, as far as possible, the causes and conditions of failure, as well as to seek by experiments reliable rules for testing the value of some of the rubber articles of most general use, such as belting, hose, packing and the like. A contribution of immense importance might thus be made to one of the greatest of our growing industries.

The custom of conductors accepting orders for the engineer and himself, so extensively practiced on different roads, has been shut down on by Superintendent Blank of the X. Y. Z. road. A few days since a passenger conductor signed for his engineer and mistook the order in such manner that his train met an express on the main track; and an order has been issued that hereafter both men must sign for orders.—*Exchange.*

"And mistook the order in such a manner that his train and the other met on the main track." This is the essential part of the above quotation from a Western paper, and the moral of it is quite plain and takes the shape of a question: Is this the first time that Superintendent Blank ever heard of such a mistake being made? Moreover, is it certain that the same kind of blunder has not been made even on that very road? Instances have certainly been numerous enough for the past 20 years in this country; why wait until now to learn the lesson? One of the curious things observable in the operating department of railroads is the issuance of orders which plaialy show that some superintendents can readily learn by experience but not by any other means. But fools can learn by experience, a great American philosopher tells us; and it is therefore, we say, strange that American railroad men do not learn by other people's experience more than they do. We have omitted the real names from the item, but if the man referred to sees this he need not feel particularly hurt, for he has very respectable company. General managers refuse to order improvements to *prevent* death and damage, when they will readily approve the same improvement where the death and damage have already occurred and done injury to their reputations. Directors will approve expenditures for safety appliances at a place where a passenger has been killed for lack of them, but will refuse approval of the same things where, in the language of a certain kind Providence continues to favor them with immunity from disaster. Cases like the one above cited raise the question whether it is not possible to arrive at some agreement as to when it is, and when it is not, best to require signatures of both conductor and engineman to train orders. The standard code indicates that the opinions of the men who made the rules were pretty evenly divided. The *rule* provides for not taking the engineman's signature, and the *form*, as printed, shows the opposite plan, there being a column provided for the signature. Those who are inclined to fall back on the standard code for justification whenever improper rules get them into trouble should be careful to note, however, that we have in this rule (509) not a justification of the practice of omitting enginemen's signatures, but rather a conspicuous example of the care with which the committee made rules to fit either one of two plans. The rule as printed is well phrased for roads where enginemen do not sign, while the simple erasure of four words and the last sentence leaves it equally strong for roads which do not requrire the signatures. Likewise the order-form can be changed in the opposite direction by a simple erasure. This is an admirable device to prevent careless alteration of the language of the standard code.

The individual call for telegraph offices seems likely to become an "issue." The telegraph operators of the Southern Pacific have had considerable negotiation with the officers of the road lately, the usual disputes about the right of operators to belong to a secret society, the question of teaching beginners, etc., being the main points under discussion. The correspondence is not published, but an officer of the Order of Railway Telegraphers, in a letter to the San Francisco *Examiner*, detailing the grievances of the men he represents, mentions the fact that the individual call bells (which have been described to the readers of the *Railroad Gazette*), by which a dispatcher can awaken a sleeping operator at any station, have been put in at a number of stations on the road, thus dispensing with the services of a night operator and adding to the duties of the day man. One operator says he "has been called up five or six times every night for the past two weeks, and all for $60 per month." Other portions of the letter in the *Examiner*, however, indicate that the writer of it does not take any great pains to present both sides of a question, and it would, therefore, be of interest to know what other duties this operator has to do; what pay he had before the rest-disturber was put in; whether the two weeks referred to were exceptional, and so on. To thus increase a day operator's duties without increasing his pay is a palpable injustice (unless he has been receiving too much, which is not often the case); but misrepresenting the severity of the conditions does more harm than good.

In New England there was in 1889 an average of 7.61 employés per one mile of railroad, 3.98 of whom were engaged in conducting transportation, 2.20 in maintenance of way and structures, and 1.21 in maintenance of equipment; the other 0.22 being credited to the "general administration." For every man employed passenger trains were run 519 miles and freight trains 408 miles, and there was traffic equivalent to 46,653 ton miles and 31,291 passenger miles; $1,366.80 of gross and $426.67 of net earnings. In the Middle States the number of employés per mile of railroad was 11.38, and per employé there were 496 freight train and 335 passenger train miles, 110,544 ton-miles and 15,766 passenger miles, $1,266.61 of gross and $435 of net earnings. We may regard these figures as representing the amount of work a man can do with such tools as a railroad and its equipment. It will be more easily comprehensible, probably, if we give the amounts *per day* per man, namely, in the Middle States: 1.36 freight and 0.92 passenger-train miles, 303 ton miles and 43 passenger-miles, $3.47 of gross and $1.16 of net earnings. The man thus seems to do a very large day's work, but the wages received for the work by his employer seem small.

The Webb & Thompson electric staff system, which is an interlocked block apparatus for trains in both directions on single track roads, and which was described in the *Railroad Gazette* of Aug. 1, 1890, is to be used on about 500 miles of the government railroads in New South Wales. The apparatus will here be required to perform exacting functions, as there is a heavy traffic on some parts of the lines, and the distances between stations vary greatly. The signaling on the New South Wales railroads is conducted and maintained on an enlightened scale, about 47 per cent. of the switches being fully interlocked, and a regular block system being in force on many of the double track lines. Tyer's tablet system, introduced some years ago, is used on the single track lines southward from Sydney. Most of the passenger trains on these roads have electric communication between passengers and trainmen. The Webb & Thompson staff system has been adopted by a number of roads in England, and we understand is soon to be put in use on a large mileage in Ireland.

The Pratt and Whitney Company has received orders for twelve sets of the M. C. B. coupler gauges, six of which are from railroad companies, and six from coupler manufacturers. It is necessary that orders for fifty of these gauges be placed, before that company will

feel justified in making the tools to do the work quickly and cheaply, and the Secretary of the M. C. B. Association has issued a circular asking that orders be sent in at once by those who expect to use these gauges. No one need have any hesitation about ordering them. They are the standard of the Association, and should be adopted by every railroad company, and also by every coupler maker. They are not expensive, and are essential to duplication of couplers, and sooner or later must be purchased by all. The earlier the orders are placed, the quicker the gauges will be made. It is hoped that enough of them will be in service before the next Convention to prove their value.

NEW PUBLICATIONS.

Dynamics of the Sun; being No. 1 of Woodbridge School Essays. By J. Woodbridge Davis. New York: Woodbridge School, 1891; and D. Van Nostrand Co.

We have had a little trouble to decide just what to call this production. It is rather thick for a pamphlet; it has a gay and ephemeral looking exterior for a were book; we cannot in conscience call it a treatise, and so we conclude to fall back on monograph, which is always a good, mouth-filling word. This monograph, then, is handsomely got up. The paper is thick and smooth; the margins are wide; the type is agreeable and the compositor has shown taste and skill in arranging the equations. Probably the proof-reading is good also, but we have not read closely enough to judge of that. Finally the cover is of heavy white paper and has the appearance common to pretty volumes of scraps from the poets, and sayings of pious men. On the whole the monograph is an ornament to lay on the table of a clergyman or lawyer who has a reputation to sustain as an amateur astronomer or mathematician, and there we should have let it lie but for two things: The D. Van Nostrand Co. has been induced to put its imprint on the title page of the second copy that we have received; and accusations are made against certain estimable and reputable men which ought not to pass unnoticed. We feel, therefore, that we have a duty to do, and shall do it as briefly and gently as we can.

It would be hard to imagine a more glaring misuse of mathematics than is made by the author of "Dynamics of the Sun," and yet he assures us himself that "his name as a mathematician has fallen below its deserving." We will add that, like the man in the play, his modesty has often been admired. He undertakes to discuss the behavior of a gaseous atmosphere surrounding a heated solid nucleus, applying the discussion particularly to the case of the sun and planets. Assuming that there is a relation between the temperature (τ) of a given atmospheric stratum and its distance (r) from the centre he calls this relation $\tau = f(r)$. He immediately treats $f(r)$, as if the form of the function had been fully investigated. This simple and easy method of obtaining physical formulæ leads the author to the remarkable conclusion that the difference in potential (due to heat) between different strata of the sun's atmosphere is causing that atmosphere to fly off from the central body of the system at an enormous speed. But this is only a part of this remarkable discovery. This out-sweeping solar atmosphere is continually grazing the plants and carrying away a part of the atmosphere of these bodies. Of course in order to arrive at this conclusion it is necessary to neglect the attraction of the planet itself upon this "outflying" atmospheric matter, but the author does not allow a small matter like this to trouble him in the least.

The entire work is filled with similar absurdities. The author shows throughout his ignorance of the literature of the subject and his want of acquaintance with original investigations in celestial mechanics and solar physics.

But the part of this monograph which is of the greatest human interest and which is pervaded by a subtle humor that would have made the author's fortune if it had been rightly directed, is a preface of a little over a page. This, by a singular oversight, is omitted from the edition which bears the imprint of the D. Van Nostrand Co. This preface points out the unscrupulous brigandage which various authors have practiced with regard to Mr. Davis' works. For instance, in 1876-77, he made known "the germs of a new process for computing areas of polygons," and this method was later developed into a complete theory of polygons published in Van Nostrand's *Engineering Magazine*. The method has spread widely in practice and in print, and it is incorporated in Davies' "Surveying" and Gillespie's "Surveying;" pages of Prof. J. B. Johnson's "Surveying" are devoted to the exposition of the method, and Prof. Simon Newcomb introduces the theory into his treatises on geometry and trigonometry. And all of this is done without acknowledgment of Mr. Davis' prior discovery. We might add that these scoundrels also used tables of logarithms without acknowledging their indebtedness to Mr. Davis for them. In fact, the "germ of the new process for computing the areas of polygons" is as old as the Cartesian geometry and is found in all general treatises on analytical geometry, although not, it is true, in all school text books.

Professor Johnson is also accused of conveying pages of matter extracted from Mr. Davis' "Formulæ for Earthwork" without a single word of acknowledgment. Of the justice of this charge we cannot judge finall y without giving it more time and attention than it is worth, but we doubt if it will stand any more investigation than the author's claim to the method of computing areas of polygons.

Finally, it would be unjust to Mr. Davis and to the readers of the *Railroad Gazette* should we fail to print in full the following paragraph, which is the gem of the whole monograph: "While the author has been compelled by other manner of work to remain ten years a passive observer, he has been flattered to find the efforts of his student life so well regarded that they have been permitted the companionship of brighter names. He desires not, indeed, to see his thoughts go masking behind other men's grimaces, yet has ever found more pleasure in the conception of new ideas than in the after claiming of them for his own. Thus it has happened that his name as a mathematician has fallen below its deserving; and so should be allowed to remain were it not that into a field where so many well-known laborers are ingeniously working it might, then, seem presumptuous for him to enter, coming like a knight unheralded to an important tourney."

Cassier's Magazine.—This very respectable looking magazine is the latest venture in the field of engineering periodicals. We suppose that it is to be published monthly by the Cassier Magazine Co., Potter Building, New York, price 25 cents a number; but there is nothing positive said on the covers, or between them, so far as we can discover, as to the price per year or periods of issue. The principal articles for the November number are as follows: Philosophy of the Multiple-Expansion Engine, by Prof. R. H. Thurston; Effect of Compression Upon Shaft Friction, by Prof. Geo. I. Alden; Steam Engine Breakdowns, by Prof. John E. Sweet; Methods of Reducing the Fire Loss, by C. H. J. Woodbury; Steam Power and the Coal Bill, by Thomas Pray, Jr.; Subdivided Power; Welding and Flanging Boiler Plates; Profit-Sharing Abroad; Stationary Engineers' Associations, with portrait of William Powell, President of the National Association of Stationary Engineers; Piecework or Daywork; Boiler Manufacturers' Association, with portrait of the President, James Lappan; Early History of the Steam Engine; Limits of the Battle-Ship, by William Kent, M. E.; Electricity Applied to Pumping Machinery, by F. Meriam Wheeler, M. E.

State and City Supplement of the Commercial and Financial Chronicle. October 31, 1891, New York. William B. Dana & Co.

The State and City Supplement is a new enterprise of the *Financial Chronicle*. It, like the Investor's Supplement, is given to every subscriber to the *Chronicle*, but we believe that neither one is sold. The supplement purports to give the indebtedness and describe the bonds or other securities issued by each state and municipality. The supplement has been in preparation for nine months, and the editors say that they have found it a task of unexpected difficulty, which we can well believe. It was started with the notion that 50 pages would suffice to contain the history and description of these debts. When 180 pages were reached it was decided to stop arbitrarily. It is admitted therefore that the supplement is still incomplete, but knowing the care that is put into the weekly work of the *Chronicle* we have no doubt as to the conscientiousness and the substantial accuracy of this publication.

The Engineering Magazine. November. New York: The Engineering Magazine Co. Price 25 cents.

The leading article in this issue is by Mr. Edward Atkinson on the Lessons of the Park Place disaster. Mr. Atkinson concludes that this building was overloaded and it was not constructed to carry with safety the machinery placed in it, although its fall may have been initiated by some comparatively slight shock, as an explosion. The fire which followed the fall was simply an incident. Some tables of safe loads of wooden beams and of weights of merchandise, with illustrations of the modern methods of factory and warehouse construction are given. To most persons interested in this subject the paper will of course seem to be a re-statement of very well-known matters. Other papers are An American View of British Federation, by Andrew Carnegie; The World's Fair Buildings, by Mr. Freitag, Assistant Architect of the Exposition; Perlis of Coal Mining; The Limit of Armor for War Ships; The Manchester Ship Canal and The Equipment of Pumping Stations.

The History and Development of Steam Locomotion on Common Roads. By William Fletcher, M. E. Octavo, 288 pages; 108 illustrations. London and New York: E. & F. N. Spon. 1891. Price, $3.

Mr. Fletcher has attempted to trace the history of steam locomotion from the earliest studies and experiments down to the present time. He divides his book into the period of speculation, the period of experiment, the period of successful application, the modern period, and practical notes on the design and construction of road locomotives. A few pages are also devoted to the traction engine law of Great Britain. The illustrations go back as far as Sir Isaac Newton's locomotive of 1680, and the historical part of the work is very full and valuable. The modern period contains numerous illustrations, in perspective and in detail, of the most recent road engines.

Report of the Sixth Annual Meeting of the Illinois Society of Engineers and Surveyors. S. A. Bullard, Secretary, 208 South Sixth street Springfield, Ill. Price 40 cents.

Besides the papers and discussions produced at the sixth meeting this report contains a list of the members of the Society and a general index to its reports from 1886 to 1891; a good deal of very good literature has appeared in these reports. The present issue contains 17 papers on a great variety of subjects occupying over 100 papers. Over 30 pages are taken up by topical discussions on 10 different subjects, and there are about 50 pages more of reports. The seventh annual meeting of the Society will be held in Chicago the last week in January, 1892.

The Mechanical Errors in the Common Theory of Flexure. By R. H. Cousins. Austin, Tex. 1891.

In a pamphlet of 31 pages Mr. Cousins considers some of the criticisms that have been made upon his work entitled "The Strength of Beams and Columns." The reader who is interested in these matters may remember that the *Railroad Gazette* reviewed this book in July, 1889, and that Prof. Cousins was not altogether satisfied with the criticisms made by our reviewer. The discussion which ensued did not last as long as it might have lasted had we not felt compelled to restrict severely the space given to it in the columns of the *Railroad Gazette*. In this pamphlet of 31 pages Prof. Cousins has the opportunity to go over the matter at more length.

Transactions of the American Society of Electrical Engineers. August and September, 1891. Ralph W. Pope, Secretary, 12 West 31st street, New York. Price 50 cents.

This double number of the *Transactions* contains the papers and discussions presented at the General Meeting May 21. More or less of this material has already been published in the technical journals, but the papers are valuable. There are seven of them in all, and they include one on Rapid Transit by Mr. F. J. Sprague; on An Open Coil Arc Dynamo, by Mr. M. E. Thompson, and On Electricity in Mining Work, by Mr. S. F. Walker.

The Transit. Published semi-annually by the State University of Iowa. Price, 50 cents.

This pamphlet, besides some information concerning the officers and courses of this university, contains seven papers read before the Engineering Society. The longest of these is a mathematical discussion of Secondary Strains by Mr. Wallberg, one of the editors. There is a brief paper on fresh and salt water in cement mortar and one on the holding power of railroad spikes and lag screws, with the results of some actual experiments.

Journal of the Franklin Institute. October, 1891.—The first paper in this issue is the Steamloop, by Mr. Walter C. Kerr, of the Westinghouse Machine Co. This interesting device has already been described in the *Railroad Gazette*, but not at all as fully as in the lecture by Mr. Kerr which appears in the *Journal*. Other papers are on the Galveston Harbor, by Prof. Haupt, and on the Inertia of Connecting Rods and Couplers and the Pressures on their Pins, by Prof. Klein.

Experiments to Determine the Strength of American Vitrified Sewer Pipe. By Prof. Malverd A. Howe, C. E. Chicago: John H. Weston. 1891.

This pamphlet is a reprint of a paper published in the *Journal of the Association of Engineering Societies*, which was read last February before the Engineers' Club, of St. Louis. Pipe from all the principal makers was tested. The apparatus is shown and described and the results are tabulated.

The Compass; No. 4, November, 1891. New York, Keuffel & Esser Co. Subscription $2 a year.

This is a pamphlet of 16 octavo pages, devoted principally to engineering and office instruments and their uses. The November issue has a paper on the plain transit, another one on scales for the drafting room, and others on the slide rule and its uses.

TRADE CATALOGUES.

The National Car Heating Co., of Topeka, Kan., publishes an illustrated circular showing the Searles system of car heating by steam and hot water. The circular contains letters of commendation from several railroad men.

Horizontal Boring and Drilling Machines. Nicholson & Waterman Mfg. Co., Providence, R. I. 1891.

This is a nicely illustrated circular, the scope of which is sufficiently indicated by its title.

Circulars of the C. W. Hunt Co., 45 Broadway, N. Y. City.

The titles of the descriptive circulars issued by this company are Coal Handling Machinery (two circulars), Cable Railways for Carrying Merchandise, Industrial Railways, Manilla Rope for Transmission in Hoisting, Engines and Boilers, Wire Rope, Blocks, etc., and the Hunt Universal Conveyor. The whole set of circulars make a really interesting collection of technical material. A remarkably wide field of industry is covered and many very ingenious applications of power for the transportation of material are shown.

Corporation Legislation.

The address of President Simeon E. Baldwin, of the American Bar Association, at its annual meeting at Boston, contained the following summary of legislation of the year concerning railroads and other corporations:

Laws against corporate trusts and combinations to raise prices, or in restraint of trade, have been passed by Alabama, Illinois, Louisiana, Maine, Missouri, New Mexico and Tennessee. That of Alabama contains an exception in favor of farmers holding their own products for higher prices.

The new constitution of Kentucky makes cumulative voting the imperative rule, in the election of officers of every private corporation.

Minnesota has modified its railroad commission law, in deference to the decision of the Supreme Court in the case of Chicago, Milwaukee & St. Paul Railroad Company v. Minnesota, 134 U. S. 418, by allowing an appeal on the question of reasonable rates from the commissioners to the courts, and Texas has adopted a similar provision. In Florida, where the courts have taken the same view of the constitutional question, the law creating railroad commissioners was repealed altogether.

North Carolina and Oregon make the decision of the commissioners only *prima facie* evidence that the tariff they may arrange is a proper one, and Oregon expressly requires them to adjust it so as "to allow a fair and just return on the value of the railroad."

Louisiana, by a direct statute, forbids railroads to charge passengers over three cents a mile.

North Carolina, in creating a board of railroad commissioners, has made an important innovation by constituting them a "court of record, inferior to the Supreme Court," invested with "all the powers and jurisdiction of a court of general jurisdiction" as to the subject of railroad regulation.

The Supreme Court of Arkansas recently decided that railroads were not bound to look out for trespassers on their tracks. This has led to the passage of a statute there requiring railroad companies to maintain such a lookout on all trains, and in case of any accident to prove affirmatively that this was done.

Ohio forbids railroads to employ as a conductor on passenger trains any one who has not served in some way as a train band for two years previously; or as an engineer any one who has not served three years as a fireman.

Georgia forbids the employment by railroads of boys under eighteen as train dispatchers.

Louisiana, Tennessee and Texas require all railroads to provide separate cars or compartments, equal in character, for whites and blacks, and prohibits those of either race from riding in the cars set apart for the other, with an exception for nurses with children. Arkansas has passed a similar law omitting the provision for seating colored nurses in the car for whites, and adding one assigning officers in charge of prisoners to the car where prisoners belong. Alabama, in a similar statute, omits both of these exceptions, but makes another more necessary, in a legal point of view, in favor of passengers brought into the state on through tickets bought in other states where no similar law exists.

Arkansas requires all railroads to maintain bulletin boards at each station where there is a telegraph office, on which information shall be given if any passenger train is 10 minutes late as to when it may be expected to arrive.

Arkansas also requires railroads to provide at each station suitable stage planks or trucks for the removal of baggage, and prohibits "tumbling trunks and baggage from their car doors on to the depot platforms." For any damage to baggage, by rough and careless handling, the company must pay the owner, in addition to making good his actual loss, from $25 to $200, as an encouragement to long-suffering travelers to vindicate their rights by suit.—*Railway and Corporation Law Journal.*

Fast Long Distance Speed.

LONDON, Oct. 12, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The recent run of nearly 440 miles made on the New York Central has created a good deal of interest in England. For long distance running the fastest time made here hitherto on the Northwestern is said to be a journey from London to Edinburgh in August, 1888, when the distance of 400 miles was covered in 433 minutes of running time, though the actual journey occupied 478 minutes, including the three stoppages. It is said that recently a short run was made by a Northeastern compound at a mean speed of 86 miles per hour, but the above 400 miles was only covered at a mean running speed of 55½, which is considerably less than the 61¼ miles per hour speed of the American train, though the rival run of the Great Northern was done at 57.8. Such a feat is undoubtedly most creditable to the crews of the three locomotives engaged. I would have said to the three engines did it not appear from such a record that what one engine can perform so can another, and it will now be very seriously asked if such a record is possible one day can it not be done frequently?

Unfortunately for us on this side the competition which brought about the London to Edinburgh speeds was discontinued by a sort of mutual consent, and the time went up to the old eight-hour rate.

No one in the face of facts can dispute what you say in regard to the proved sufficiency of coupling rods of modern design for the highest attained speeds. To Englishmen it is not so much the proved strength of the coupling rods that will appear wonderful, for top speeds have been made here with coupled engines, though, of course, with larger wheels, but it is the fact of high speeds with wheels of such small diameter that appears the most striking point in the American performance. The valve travel of 7 in. may receive a good deal of the credit of this.

In your comments on the run you say that side rods having been proved so satisfactory there is now no fear of being compelled to resort to single engines and sacrifice the traction due to coupled wheels. Now it would be interesting if you would show that the rotative effort on the crank pin of a single engine at high speed (or moderate speed) is anything approaching that necessary to slip the wheel. Single engines in this country—damp and greasy as the rails so often are—do not slip. They do not slip much at starting, and I do not think sufficient evidence has ever yet been brought forward to show cause for continuing the use of coupling rods, however good or strong they may prove themselves.

On some lines and among certain engineers on this side the single engine could not get a good word. At one time I believe there was no single engines running on the Midland Railway. It was claimed they would not do the heavy work of the line, on which the gradients were so much more severe than on the Great Northern, which did use them. But the Midland has progressed and now runs singles on its heaviest traffic with the best of results, and singles have always done their work on less fuel than coupled engines.

An American engine would be no less American in type if the rear driver were uncoupled and reduced to 45 inches, and the same enterprise which has shown the possibility of the magnificent run on the New York Central might very well extend itself to making a trial with rods removed, any necessary correcting in the balancing being made with temporary balance weights bolted in the wheels.

You rightly call for higher mean effective pressures, before higher speeds can be attained than have been; but decreased mechanical resistance would do just as well and side rods are a cause of resistance and have no legitimate place on any engine whose rotative force is so much less than its adhesion weight on drivers. I have known the capacity of a single engine to do certain work to be denied in the face of the fact that the work was being done and well done. Excepting the Rocket, the early English locomotives were coupled, first with chains I believe, then with toothed wheels and at last with rods as to-day. Before locomotives were coupled they were run on rack rails, for it was reasoned that the wheels would slip, and no end of expense was incurred because no one would try the effect of a smooth wheel gripping a smooth rail.

There is reason in coupling a freight engine at a low speed, simply because of the large mean pressure and the transference of this to the rail without the equalizing tendency of the reciprocating parts which comes in at high speeds, and there have been the best of reasons for adhering to coupling of American locomotives of all classes, until within quite recent times, for high speed has been, if not actually unnecessary, at least impracticable, by reason of the extremely rapid construction of some railroads, which were built to cover distance and were necessarily of poor construction and wholly unfit for high speeds.

The growth of population, which has alone rendered possible the improvement of the railroads, has altered all this, and fast service employing its own special type of engine is now of sufficient magnitude to call for a class of engine which hitherto would not have paid. Quick transport must daily become of greater importance with you. Taking the population of the United States at 60,000,000, every individual makes 8.7 journeys by rail every year. I believe, too, that this estimate includes season ticket journeys or commutators. In Britain, with 40,000,000 of a population, every individual makes an average of 20.4 annual journeys, and this does *not* include the many millions of journeys daily by season ticket. The average length of journey here is less considerably than the average American journey, but not nearly so much less as the relative areas of the countries are different, and something may be due to this fact. Much, however, is due to the greater average speed, which is always advancing, except, of course, in the "bad corner" south of London, and high speeds may be expected to do very much more in America than here in the way of increasing the number of passenger journeys, because the amount, and therefore the value, of time to be economized is so much greater.

Stated roundly, the Englishman travels three times as often as the American, but when the latter does travel he takes a journey three times the distance, and so in a year he travels the same distance as the Englishman, but he spends more time in doing this.

America thus offers an enormous field for a fast train service, and should be fully as well able to keep employed a special type of engine to do special duty, as in England. To adhere to coupled engines just because they have been necessary in the past, and may be still safely employed, seems out of keeping with American traditions, which are more in the direction of progress than your somewhat conservative remarks appear to indicate.

W. H. BOOTH.

TECHNICAL.

Manufacturing and Business.

The turnbuckle department of the Central Iron & Steel Co. was partially destroyed by fire on the morning of Oct. 30, causing a loss of about $10,000. The rebuilding of the works will be commenced at once, and it is hoped that they will again be ready for operation in about a month. All orders for turnbuckles will be promptly filled, as a large stock of finished buckles was on hand and many in process of manufacture were saved, not being damaged, and temporary arrangements are being made to complete those unfinished when the fire occurred.

The Scarritt Furniture Co., of St. Louis, has had an unusually large business lately. During the past month it has delivered the Forney-Scarritt car seat for ten cars for the Chicago & Northwestern, four cars for the Chicago & Alton, one for the Erie, two for the International & Great Northern, two for Australia, six for the Wabash, ten for the Chicago, Burlington & Quincy suburban, and ten cars for export. The firm has now on hand new orders for 30 Chicago, Burlington & Quincy cars, 10 cars for the Chicago & Northwestern, 25 for the Chicago, Milwaukee & St. Paul, 16 being for coaches and chair cars; 10 for the Cincinnati Southern, 15 for the Toledo, St. Louis & Kansas City, and 20 cars for export.

One of the latest enterprises at Vancouver, B. C., is the British Columbia Iron Works. The company has erected machine shops, foundry and molding shops, pattern shop and boiler works. In these have been placed machinery costing $35,000, and the company is now engaged in manufacturing boilers, engines and other heavy machinery.

Application is being made to the Canadian government for letters patent incorporating the Taylor Decarbonized Iron Mfg. Co., of Montreal, with a capital of $150,000. The company is organized to work the Taylor process of decarbonized iron, to erect foundries and rolling mills, and to acquire land containing iron and other minerals and petroleum not exceeding 20,000 acres.

Iron and Steel.

The new sliding scale for the Edgar Thomson Steel Works, at Bessemer, Pa., which is to go into effect in January, has been satisfactorily settled between C. M. Schwab, General Superintendent of the plant, and the men in all the departments.

The new works of the Alabama Rolling Mill Co., at Birmingham, which were destroyed by fire last June, are about completed, the puddle mill has started up full time and the finishing mill will resume in about two weeks. Seven new puddling furnaces and two gas-heating furnaces have been added to the plant, which will increase the output to about 80 tons of finished iron per day.

The National Forge & Iron Co.'s rolling mill property at East Chicago, Ind., has been sold by the receiver to Weaver, Getz & Co., of Chicago, who paid $17,000 for the material on hand and $34,600 for the plant. The works cost about $250,000, and were built less than two years since. Weaver, Getz & Co., are coal merchants, and were large creditors of the company.

The litigation over the settlement of the affairs of the Worcester Steel Works, Worcester, Mass., has been brought to a close by the payment of $200,000 to the assignees by a new corporation, organized as the George M. Rice Steel & Iron Co. Nearly all the stock of the new concern will be owned by Hon. George M. Rice, who was the president of the old concern. It is as yet undecided whether to resume business at the works at Worcester or to erect a new plant at Portsmouth, R. I., where the company owns a coal mine and a large tract of land.

New Shops.

The Edison shops of the Northern Pacific, near Tacoma, will be put into operation about Nov. 1.

Interlocking.

The National Switch & Signal Co. has recently taken contracts for interlocking plants as follows:

On the Cleveland, Akron & Columbus: one at Akron Junction with 21 working levers and 7 spare spaces; one at Akron with 42 working levers and 6 spare spaces; one at Warwick Junction and crossing with 37 working levers and 7 spare spaces.

Central Railroad of New Jersey: one at Cranford with 32 working levers.

The company has completed standardizing all its patterns to conform with the latest and best practice in railroad signaling.

An Automatic Dump Car.

The catalogue issued by C. W. Raymond & Co., of Dayton, O., illustrates, among other appliances, an automatic dump car for contractors' use which is constructed with an inclined floor so that the centre of gravity is shifted when it is loaded, thus giving it a tendency to dump itself when the retaining catch is slipped. The latch is thrown by a small trip bar at the side of the track if necessary. The dumping side of the pivot being relieved of its load, the preponderance of weight is then on the reverse side and returns the box to its normal position. These cars may be unloaded on any two or all four sides.

Superlative of Adhesiveness.

When a simile is desired which shall express the superlative of adhesiveness, just take the legislator and his railroad pass—there is nothing like it. Georgia is the last state to afford an illustration of this inseparable affinity. Her legislature has just refused to make the receiving and using of these railroad bribes illegal, and so falls into line with Massachusetts and New Hampshire.—*Springfield Republican.*

Engineering at the World's Fair.

The General Committee of Engineering Societies has issued a circular, giving the substance of the report made by Mr. E. L. Corthell, Chairman of the Executive Committee, which we published last week, and containing the following additional information:

It is proposed that the associated engineering societies shall maintain reception rooms in the business part of Chicago. These reception rooms and the arrangements that may be made at the Exposition building, will require the services of a secretary and several assistants speaking the principal European languages. The present estimate of expenses, to carry out these objects of the associated societies, is $15,000. As the aggregate membership of the associated societies is about 7,500, the above sum requires a contribution at the rate of about $2 for each member. The amounts to be contributed are as follows:

	Approx. Memb'ship.	Amount.
American Society of Civil Engineers	1,524	$3,000
American Institute of Mining Engineers	2,134	4,000
American Society of Mechanical Engineers	1,200	2,000
American Institute of Electrical Engineers	265	530
Canadian Society of Civil Engineers	640	1,250
Engineers' Club of Philadelphia	506	1,000
Boston Society of Civil Engineers	290	550
Engineers' Club of St. Louis	178	350
Civil Engineers' Club of Cleveland	160	320
Engineers' Club of Kansas City	62	120
Montana Society of Civil Engineers	60	120
Civil Engineers' Society of St. Paul	60	60
Engineers' Club of Minneapolis	26	50
Engineers' Association of the South	108	200
Engineers' Society of Western Pennsylvania	347	650
Western Society of Engineers	400	800
		$15,000

The Executive Committee requests that each society in the association shall proceed to raise its quota as soon as practicable, and remit to the Treasurer, Mr. W. J. Kar-

ner, 205 La Salle street, Chicago, Ill. Upon receipt of the amount proportioned to each society, such society will be furnished with cards to be distributed to its members which will entitle them to the use of the proposed facilities.

Grade Crossings in Philadelphia.

The Philadelphia City Councils' Survey Committee has approved an ordinance authorizing the Department of Public Works to contract with one of the railroad companies to depress the Philadelphia & Reading Railroad tracks where they cross the Pennsylvania Railroad tracks at North Penn Junction, the contract to cover all expenses of carrying Ontario street and Glenwood and Sedgley avenues over the Reading tracks by bridge. It was stated that the Pennsylvania would contribute $100,000 for the work, and Councils will be asked to appropriate $200,000. There are five other streets now crossing the Reading tracks at grade that will require bridges. To depress the Reading's tracks will require an excavation 2,000 ft. in length. The proposed change, if it is authorized by the Council and the money required to carry it out can be found, will remove a most dangerous crossing at grade, as well as eight grade crossings of streets in a busy and rapidly growing section of the city.

Tire Setting at Chicago and Northwestern Shops.

Those who are especially interested in devices for removing locomotive tires without taking the wheels from under the engine, should see what is being done by the Chicago & Northwestern road at the Chicago shops. A simple gas pipe ring is made with perforations on the interior surface. This is connected to a gasoline tank with proper valves and connections through which air from the pipe line, which goes around the shops, is forced and thereby carbureted. The flame produced is an extremely hot one, and a set of tires can be removed and another set replaced in about five hours without taking the drivers from under the engine and without forcing them in. The apparatus can be used anywhere within reach of an air pump, and the whole outfit does not weigh more than 500 pounds. It is not a patented arrangement, but is simply an application of good common sense, and the same rig can be devised by any master mechanic.

Car Heating.

The Consolidated Car Heating Co. has written to us saying that it wishes to warn railroad companies of various infringements and thus acquit itself of the obligation to give such notice. One such infringement is said to be of the Sewall coupler patents, in which the essential features are closely imitated. Another is placing steam drums on the crossover pipes. The company intends to prosecute all such infringements. The company publishes further the following as the substance of a telegram just received from attorneys at Washington: "The Board of Examiners of the United States Patent Office decided on Oct. 28 four important interferences covering practically the basic principles of car heating by disc, coil or other drums. The result of these decisions is to limit the use of the steam drum or jacket of any form in connection with hot water circulating systems in a car to the Consolidated, the Safety and the Gold companies. The patents which will issue are granted—one to Henry R. Towne and three to James F. McElroy. This does not affect in any way the commingler in which steam is noiselessly injected into the water of circulation in a car."

The Gold Car Heating Co., send too late for publication in full, a long letter denying the alleged infringement of the Sewall patents, and announcing that, "if any railroads using our couplers are sued for infringement, we will defend all such suits at our own expense."

The Safety Car Heating & Lighting Co. announces that the decision of the Board of Examiners of the Patent Office, on Oct. 28, besides allowing them other patents of considerable importance, granted the two claims covering broadly the steam heating of railroad cars in connection with the Baker Heater and its circulating pipes in the application of Henry R. Towne. This application has been involved in a long interference and is the property of this company. It is claimed that no other companies have any right to apply steam heat to railroad cars which is to operate in combination with the Baker heater and its circulating pipes without license from the Safety Car Heating and Lighting Co.

Electric Cranes.

The adaptability of the electric motor for use in connection with power traveling cranes is due to several important features which it possesses. It can be applied directly at the point at which the power is desired without requiring the use of any mechanical means of transmitting the motion through moving members; it enables any desired speed to be attained, from the lowest to the highest, instead of permitting only a few abrupt changes; also, separate motors may be used for each function, if desired, thus greatly reducing the amount of transmitting mechanism over those forms in which all the power is derived from a single source. These points are in themselves sufficient to warrant the adoption of the electric motor for crane construction.—*Hoisting.*

A New Roller Side Bearing.

Mr. M. F. Mullen, foreman of the machine shop of the Chicago, Boston & Liverpool Co., at Elsdon, Ill., has invented a new roller side bearing which has been applied to over 3,000 cars. It consists of a base carrying a roller, which is mounted on an axle, with small cylindrical rollers between. It is extremely simple, and can be applied at a low cost. A large roller is made of cast steel, and the pin bearing and small rollers are of cold rolled steel. Wheel side bearings have given trouble by wearing flat in spots, but this bearing, by reason of the rollers, does not require lubrication, and no flat spots have developed in a year's service. The development and introduction of this device are in the hands of Mr. R. G. Chase, who was formerly business manager of the Williames system of car heating.

Steel Sheets From Fluid Metal.

At the London meeting of the Iron and Steel Institute of Great Britain, Sir Henry Bessemer read a paper in which he called attention to a patent obtained by him in 1846 for rolling tin foil and sheet lead direct from molten metal, and in 1857 another patent was obtained for rolling continuous sheets and thin bars of iron or steel direct from fluid metal. But, he says, the plan "did not excite a great amount of enthusiasm in the minds of tin plate manufacturers of that day. In fact the whole scheme was simply pooh-poohed and laid aside without any serious consideration of its merits." Now, when it is an open secret that a large sum of money has been placed in a Chicago bank to be used in perfecting machinery which has for some time tentatively, at least, rolled continuous sheets from molten metal, Sir Henry calls attention to his early researches and conclusions, which he issued in patent drawings, showing, in effect, a pair of large rolls through which cold water is to circulate. He also proposes certain improvements in feeding the metal, adjusting the distance between the rolls and cooling the product. That portion of the paper which may command the greatest interest is his views as to the toughness and cohesion of the product which is to receive so much less work than sheets as made at present. "Mild cast steel," he says, "is a crystalline substance, and follows the inevitable law of all crystalline bodies, in so far as the size of the crystals depends on the bulk of the mass and the time allowed for their formation; the longer the time allowed, and the greater the mass, the larger are the crystals obtained; their planes of cleavage are also more clearly defined, and are more easily separated from each other, or, in fact, have a less amount of cohesion. ... In lieu of the two or three hours allowed in ordinary cases for the development of crystals, we have, when using a four-feet pair of rolls, making four revolutions per minute, a transition from absolute fluidity to absolute solidity in just one-half of a second of time, in a mass of only one-tenth of an inch in thickness; and if crystals are developed at any period during the half second of time occupied by this transition they must be microscopic indeed, and possess but little, if any, of the properties that are developed in large masses during hours of repose in the soaking-pits; hence it appears to me highly probable that the homogeneous fluid metal will pass at once into a perfectly homogeneous uncrystalline body, and being subjected to fluid, semi-fluid, and solid pressure in rapid succession, will develop the full cohesion in force and toughness which the metal is susceptible of."

In the course of the subsequent discussion Mr. G. J. Snelus expressed his conviction of the success of the process, adding: "By the carrying out of the process the cells caused in the steel by contraction, or by the evolution of gas from the steel, would be avoided, and the steel produced would be found to have a much greater tensile strain and more ductility than could be obtained by any process of making an ingot and allowing it to cool."

Sir Henry thought that by using drums of 10 or 12 ft. in diameter, plates three-quarters of an inch or more in thickness could be produced. He estimated that with walls 18 in. wide and 4 ft. in diameter, making four revolutions per minute, one ton of plates, one-tenth of an inch thick, could be produced in seven and a half minutes.

A New French Compound Locomotive.

The Northern Railroad of France has recently put into service a new compound locomotive built by the Société Alsacienne de Belfort, having four driving wheels connected together, and four cylinders, two high and two low pressure, the large cylinders being between the frames. Those who visited the Paris Exposition will remember that this company exhibited a compound locomotive of this general type except without parallel rods. It differed from the Webb engine mainly in having two low pressure cylinders instead of one. In the engine exhibited the low pressure cylinders were on the outside of the frame, and connection was made between these and the rear driving wheels by means of an extended piston rod working through a bushing in the yoke with a crosshead and guide placed some distance from the cylinders. It seems that some considerable difficulty was found in starting trains without parallel rods. The new engines with the parallel rods will be thoroughly tested in high speed work. This road now has at least four kinds of compounds, namely, the Woolfe, with tandem cylinders, a three-cylinder compound with parallel rods, a four-cylinder compound without parallel rods, and a four-cylinder compound with parallel rods. All of these engines, excepting the last, have been illustrated in the *Railroad Gazette.*

Propellers for Sound Steamer Lines.

The "Maine," 'one of a pair of new Sound steamers for the Stonington line to Boston, has been launched at the yards of Harlan & Hollingsworth, Wilmington, Del. The vessels are to have screw propulsion, are to be 310 ft. in length over all, 44 ft. breadth of beam at load water line, and 66 ft. at the guards, and are to have a draught of 12 ft. 6 in. loaded. The engines are to be of the four cylinder, triple expansion type, with cylinders 51, 45 and 28 in. diameter and 42 in. stroke, operating a screw 13 ft. 6 in. diameter. The boilers are to be of the Scotch type, 13 ft. 6 in. diameter and 11 ft. 6 in. long, carrying a steam pressure of 160 lbs. to the square inch. The total grate surface will be 274 sq. ft., and forced draught is to be used. The hull is divided into seven separate water tight compartments.

The same company is building a new propeller for the New Haven line. This one will have twin screws and a pair of triple expansion engines with cylinders of 60, 38 and 24 in. diameter and 30 in. stroke. The size of the vessel is 315 ft. in length over all, with 300 ft. on the water line, 47 ft. 10 in. breadth of beam, with 18 ft. 6 in. depth of hold. The New Haven boat is to have a speed of 20 miles per hour, and the Stonington boats 17 miles per hour.

New Ore Docks at Ashtabula.

Iron ore was first received at Ashtabula in 1873, and since 1883 the amount received at that port has increased from 670,000 tons to 2,176,733 gross tons last year. The two railroads shipping from this port are the Pennsylvania and the Lake Shore, the last-named company having handled 54.1 per cent. of the business last year, although it did not commence business until 1875 and did but 29 per cent. of the business in 1885. Now the dock frontage of Ashtabula, 10,200 ft. for coal and ore, is inadequate, and the Lake Shore Railroad Company have commenced an addition of 8,300 ft., of which 1,800 ft. are just completed, and the balance of the proposed dock front will, it is understood, be pushed to a speedy completion.

This new dock front has been made partly by building a breakwater in the lake, connected with the government channel, and partly by excavating slips. The main quantities so far used were 127 cribs 40 × 42 ft. and from 8 to 22 ft. deep. For their construction 7,500,000 ft. of timber—pine, hemlock, oak and elm—was required, which was held together by 225 tons of drift bolts and anchored in place by about 24,000 cu. yds. of limestone. In addition, 250,000 cu. yds. of earth and 100,000 cu. yds. of rock were dredged to form a slip. The work has been done under the plans and charge of A. V. Powell, C. E., of Chicago. The dock already built is equipped with 12 hoisters and conveyors, of Brown's pattern, so that two ore-carrying steamers, with six hatches each, can be unloaded at one time, and a vessel bringing 2,500 to 2,800 tons of ore to that port can clear again within 9 or 12 hours.

Shipbuilding on the Lakes.

Until lately very few orders have been received by the lake shipyards, and for the first time in two years the weekly report of the Commissioner of Navigation mentions no vessel from the lakes applying for an official number. But with a moral certainty that nearly all the available Lake Superior ore will be used by the opening of navigation and with a great deal of grain to come forward through all of next season, new contracts and inquiries are getting frequent. These cover passenger steamers, package freighters, and ore carriers. Of the best, two boats for the Lake Superior Iron Company, lately let to the Cleveland Ship Building Company, present a new type of lake vessel, viz.: a cross between the ordinary ore carrier and the whaleback. Their sides will "tumble home" to meet concave decks that will be without other houses than a turret forward for steering wheel, anchors, etc., and another larger one aft on which will be the cabin and over that a "Texas" or pilot house. This new style of vessel will be known as "Monitors."

In the mean time the lake vessel owners are troubled over the earnings of the tramp steamers carrying grain across the Atlantic. It is claimed that these are making about 8 per cent. on their cost each round trip, and a great many of our lake vessels would spend the winter on the Atlantic in an effort to share those gains, if it could be done without cutting the vessels in two, and virtually preventing their return to the lakes.

The Westinghouse Engine.

The Westinghouse Machine Co. claims that the Westinghouse engine was the first to be directly connected for running a dynamo. It seems that it was called into existence by the desire of the Brush Electric Co. to procure an engine to run an electric headlight where belt transmission was out of the question. The terms of the problem were that the speed must not be less than 1,000 revolutions, and the power developed not less than 1½ net H. P. The engine must be able to stand up under 150 to 180 pounds of steam; it must be self-contained, so as to be bolted to the locomotive, like a brake pump; it must be sufficiently rigid, so as to stand all the shock and jar of service; it must be inclosed completely, as a protection from dust and cinders; and, finally, it must be capable not only of several hours' continuous running without attention and of continuous service day after day, but must be of such a design as to run for an indefinite time without any attention what soever while the locomotive is side tracked and the engineer absent.

The United States Rolling Stock Co.

At the meeting of the creditors of the company, held at 29 Nassau street, New York City, last Friday, it was voted to accept the plan of the company's lawyers, for the organization of a new company. It is proposed that the unsecured creditors shall be paid 30 per cent. cash, 20 per cent. on the first mortgage bonds, a similar per cent. on the second mortgage bonds and 30 per cent. on the preferred stock. Old stockholders are to pay an assessment of 20 per cent. on their stock to provide working capital. An amount of $500,000 has been assured, which will be increased to $700,000. Creditors holding about $850,000 of the debts of the company were represented at the meeting, and a number objected to the plan for organizing a new company. The committee appointed to examine the books of the company found the liabilities to be as follows: Receiver's certificates, $733,000; additional floating debt, about $59,000, making a total unsecured debt of $792,656. Six per cent. coupon debenture bonds, $970,000. Total indebtedness, $1,762,000. The indebtedness will be increased if property in the West on being sold fails to cover a mortgage of $1,250,000. The assets give a total of $844,000, whereas it has been supposed that there were assets amounting to fully $2,250,000. Rolling stock set down for $300,000 is really worth but $30,000; supplies on hand believed to be $1,245,000 amount in reality to only $400,000. Of $450,000 outstanding accounts but $204,000 are of any value, and in the other items large reductions were made. It is also proposed to issue new consolidated first and second mortgage and collateral car trust bonds.

The Harvey Process of Hardening Steel.

The tests of the steel plates treated by the Harvey process at Annapolis and Indian Head, make this mode of hardening steel of great interest. The recent publication of the Harvey patents shows that it is a modification of the old process of making steel from wrought iron by cementation. Instead of packing bars of iron with charcoal in an iron box, and subjecting them to a comparatively low heat, a plate of low carbon, open-hearth, or Bessemer steel is laid on or in a bed of dry clay or sand in a suitable furnace and granular carbonaceous material is packed on it or about it, where the plate projects out of its clay bed; this is covered with sand and then with a layer of heavy fire-clay bricks. Heat about the temperature of melted cast iron is then applied and continued for some 120 hours until the surface exposed to the carbon has absorbed sufficient to give the proper degree of carbonization for the required depth. Mr. Harvey says substantially: The degree of efficiency possessed by the different furnaces can only be satisfactorily determined by actual trial. When ascertained, the reproduction of given results merely requires the re-establishment of the conditions as to time and temperature under which said results have been previously obtained. This involves the maintenance of the furnace at heat sufficient to melt cast iron, for the period already learned to be sufficient for the super-carburization of the plate to the requisite extent and depth. When the desired degree of super-carburization has been attained, the furnace is allowed to cool down until the plate is at a low red heat, when it is hardened by quenching in water, brine or oil.

It is also proposed to apply this process of super-carburization to heavy guns, packing the bore with powdered charcoal, and imbedding the gun in charcoal. This will, it is claimed, allow the use of a low carbon and tough steel, while the bore is so hard that it will not be cut and corroded by the powder gases, and, at the same time, the gun is hooped by a layer of high carbon steel of great tenacity.

The "Moveable Sidewalk."

The moveable sidewalk which is being tested at the World's Fair grounds, Chicago, has been practically completed, and was started some days since; but, owing to a sticking in the bearings of the back platform, it did not start off as readily as it was expected. The difficulties are being removed, and a start will be made soon. The platforms have been moved by the motors to a considerable distance, but the friction of the new work must be reduced by more freedom in the joints and better lubrication before any considerable speed will be developed. So far nothing has developed to indicate that a successful demonstration cannot be made.

THE SCRAP HEAP.

Notes.

The union passenger station at Macon, Ga., one of the oldest brick structures in that city, was burned on Thursday of last week. Loss about $100,000.

The Philadelphia & Reading Relief Association has a surplus of $206,000. A statement is published to the effect that practically all the eligible employés are members.

Last week the Grand Trunk freight house, at Paris, Ont., a frame building 250 ft. long by 30 ft. wide, was burned and five cars standing alongside the freight sheds were destroyed with the contents.

At Fort Smith, Ark., last week, a verdict of murder was returned against Alexander Lewis, who participated in a train robbery near Verdigris, I. T., July 15, 1888, in which affair a paasenger was killed.

The Empire State Express reached Buffalo Oct. 27, 10 minutes late; on the 28th, 20 seconds ahead of time; 29th, three minutes and 20 seconds ahead, and the 30th five minutes ahead, though there was a strong head wind after leaving Rochester.

The Canadian Pacific has prepared the plans for the annex to elevator A at Fort William. It is to be 80×343 ft., with a height of 122 ft., and its capacity will be over 1,000,000 bushels. The work will be pushed forward rapidly, and nearly 500 men will be engaged on the building at once.

The long strike of coal miners of the Pittsburgh district for an advance of 10 cents per ton is over, and the 12,000 men who have been idle for three months will return to work at the operators' terms. This decision was reached at a convention of strikers last Tuesday, when it was unanimously decided to declare the strike off.

The New York State Railroad Commissioners have made a report on the rear collision at Montezuma, N. Y., Aug. 6. They find the conductor of the freight guilty, and say that the points at which freight trains should be set off for a following passenger train should be fixed by the train dispatcher and then recommend the block system.

The *Station Agent*, published at Cleveland, says that one of the ticket agents of the Lake Shore & Michigan Southern who were discharged for receiving commissions, had accepted them only from the Chicago, Burlington & Quincy; and that another agent who, when discharged, asked the Western roads to return his reports, received favorable replies from every road except the Burlington.

Foreign Notes.

A hydraulic power distribution plant for Berlin, Germany, is under consideration. As at present outlined, provision is to be made for about 3,000 H. P., the water to be transmitted under high pressure through underground mains.

A rather interesting result of the Mönchenstein bridge accident in Switzerland is the offer of rewards by the Swiss railroad department for the discovery of dangerous defects in the rolling stock and permanent way. Austrian journals point out that such a system of rewards is in extended and successful use in Austria.

Cairo, Egypt, is to have a central railroad station, for which plans have recently been worked out. The station, according to present accounts, will have a frontage of 75 metres (about 246 ft.), and a depth of 88 metres (about 287 ft.), and will provide for six different lines of railroad. The estimated cost of the station is $150,000, and the building is to be completed in 1893.

The *Revue Industrielle* describes and illustrates what it calls a compound system of gearing, in which the gear teeth are made half of wood and half of metal, and in such a manner that the metal halves of the teeth of one wheel bear against the wooden halves of the teeth of the other wheel, and vice-versa. Smoothness of operation is a prominent claim made for the wheels.

German journals mention a new fast train which leaves Berlin daily and runs to Magdeburg, a distance of 141 kilometres (87½ miles), in 104 minutes. The only intermediate stopping place is Potsdam, and owing to the many curves on a portion of the line, where very high speed is inadmissible, the train runs on the remaining section at the maximum allowable—90 kilometers, or about 56 miles, per hour.

Electric lighting at one of the Dresden (Germany) railroad stations is to be tried in an experimental way. Illumination of the main and side tracks is to be effected by eight arc lamps on masts about 62 ft. high. In addition, two arc and a number of incandescent lamps are to be used for lighting freight sheds and offices. The experiment, if successful, is to be followed up by the introduction of the electric light into all the Dresden railroad stations.

Plans for the utilization of the water power of the Rhine at Rheinfelden, in Germany, have recently been worked out by the well known engineering firms, Escher Wyss & Co., of Zürich, the Oerlikon Machine Works and Zschokke & Co., of Aaran. Just above Rheinfelden a canal is to be built to utilize the fall of about 25 ft. in a distance of 1½ miles. The water to be thus made available will, it is thought, be sufficient in quantity to run 25 turbines of about 1,000 H. P. each.

According to the *Verkehrs Zeitung*, Vienna and Pesth are to be connected by a projected electric road which is to run parallel, in great part, with the state railroad on the left bank of the Danube. By taking heavier grades than the latter, however, a saving in distance of about 19 miles is to be effected in a total of 170 miles. This, it is thought, is too slight to be of any importance in influencing traffic, and it is, therefore, proposed to offer to prospective passengers the inducement of high speed—62 miles an hour as at present contemplated.

World's Fair Notes.

Transportation of visitors to the fair, between the city and Jackson Park, has been under discussion during the last week. A number of meetings have been held by the representatives of the city, the Illinois Central, the South Side cable road, and the exposition management. A sub-committee has been appointed to map out the work of transportation fairly belonging to each of the various organizations. Mr. M. M. Kirkman, Chairman of the World's Fair Committee on Transportation and Second Vice-President of the Chicago & Northwestern, considers the problem of transportation a local one, in which the Illinois Central Railroad and the cable lines are the greatest factors. He calculates that with 10 cars to a train and 60 passengers to a car 36,000 passengers may be moved in each direction per hour by this line alone. The cable people claimed when the question of location of the fair at Jackson Park was under consideration that they could carry 80,000 people per hour each way to and from the city. The carrying out of this promise will solve the whole question. The elevated railroad will also afford facilities for handling a large number of passengers. They promised that they could carry 20,000 per hour if the fair was located at Jackson Park. Water carriage will also cut an important figure in handling visitors. A dock has been suggested on the lake front with access by viaduct over the Illinois Central tracks. Other docks may be placed on the North side. Steamers may also start from points along the river. Water facilities for receiving and discharging passengers are practically unlimited.

T. C. Brooks & Company, of Grand Rapids, Michigan, have been awarded a contract for the construction of water pipe for $66,876. All bids for paving the exposition grounds were rejected and the chief of construction will re advertise for bids.

Much has been written about the progress in the World's Fair grounds, but no one can get a fair appreciation of the work being done and laid out without visiting the site. Jackson Park as it formerly was has disappeared. The trees and beautiful lawns have been cut up to make room for new streets, new trees, and building sites. The foundations are in progress everywhere. Railroad tracks wind through the inclosure in all directions, and many locomotives and large numbers of cars can be seen moving there at all hours of the day. Several buildings are up to the third story, and the large steel arches in the horticultural building can be seen from a long distance. The impression produced on a visitor is one that will always be remembered. It is that of a large city being built at one time. At the present rate of progress there will be a substantial showing made before spring opens.

A Tide Gauge Station for the Bay of Fundy.

Charles Carpmael, M. A., Director of the Dominion meteorological service, has been in St. John, N. B., for the purpose of selecting a suitable spot for the establishment of a tide gauge station. The tides at St. John average 27 ft., spring tide. In some points of Ungarva Bay the tides register over 50 ft.; Noel Bay, N. S., has tides of 52½ ft., Monction 47, Folley Point 45, Cumberland Basin 45½, Hankow, China, 38 to 50, and Frobisher Bay, 45. In the vicinity of Bristol, Eng., the tides rise to the height of 31 to 38 ft., and in some parts of South America from 36 to 46 ft. The tide gauge which will be placed at St. John gives the time of high and low water, and the height of every tide during the year. It consists of a float, which, by means of a wire or rope, rotates a wheel whose motion is reduced in speed by gearing. A pencil is worked backward and forward, as the tide rises and falls, on a slip of paper actuated by clockwork. The well in which the float rises and falls has an aperture sufficiently small to prevent the fluctuations due to wave motion from perceptibly affecting the pencil, but large enough to insure the water's rising to the same height inside as in the outside of the well.

Train Collectors.

The train agent system inaugurated some months ago by the Southern Pacific Company entitled "An act to increase passenger receipts," is not dead, but it is dying fast, and within a few weeks the old order of things will be resumed. The force of collectors has been reduced from 22 to 13, these remaining agents having charge of the Southern overland trains—Nos. 19 and 20—as far south as Bakersfield, the Los Angeles express trains—17 and 18—to the same point, and the Oregon trains—15 and 16—as far north as Ashland. On the Central Pacific overland and several other trains the collectors have been taken off; and it seems that in discontinuing the system the company is doing just what it intended to do when the men were put on six or eight months ago. Eastern roads have done the same thing, always taking the collectors off, however, after a few months' trial. For this reason it has been generally thought that the scheme was a bad one, or at least that it possessed no advantages over the usual methods of collecting fares and tickets. An officer of the Southern Pacific explains that this is all a mistake. "No road," said he, "uses the collector as a permanent check on conductors. They are used rather as a temporary example. Here is the whole thing: A collector takes a run where the conductor's receipts have been $200 a day. He (the collector) runs up the returns to $250 per day, and keeps this up for say a month. Then the conductor is allowed to take the run again after being shown what it has paid the company under the collector. This comparison inspires in the conductor an ambition to keep the returns up to a notch where the collector left them."—*San Francisco Call.*

Lehigh University No Longer Free.

The board of trustees of Lehigh University, at Bethlehem, Pa., recently passed resolutions to go into effect Jan. 1, 1892, doing away with free tuition in all departments of that institution. This step has been found necessary to provide an increased income to meet increased annual expenses, the number of students having increased in a very great ratio during the last few years, the majority being of the more wealthy and "able to pay" class. The general impression concerning this university has always been that free tuition was a permanent condition established by Judge Packer, its founder, or that it should at least be free to a certain percentage of students who were unable to afford the expenses. Both impressions, however, seem to be erroneous, and the poorer students, unfortunately, will have to look further for an education. It is, indeed, too bad that this decision of the board of trustees has been found necessary, but *ex facto jus oritur.*

A Chance for Promotion.

The report of the Pennsylvania state convention of the Woman's Christian Temperance Union contains the following: "Mrs. E. D. C. Mair, of Pittsburgh, superintendent of work among railroad employés, has had postal cards printed with her address on one side, and the pledge on the other, which were freely distributed in railroad cars. When one of these cards is signed she takes it to the superintendent of the road and endeavors to have that man promoted." If Mrs. Mair has the winning ways of some of her sisters who ask for passes, there can be no doubt that she will wield an important influence when she calls on the superintendent.

The Trans-Siberian Railroad.

The New York *Sun* recently published an article on the financial aspects of this railroad (the route of which was described at some length in the *Railroad Gazette* of July 10), announcing that all of the available money from this year's budget would be devoted to the construction of this important work, which is, if possible, to be pushed forward to completion in 1895. Though the route has been determined on in its main features, only about one-half of it has been surveyed, viz: about 1,200 miles in the central part, 700 miles east of Lake Bbaikal and 200 miles of the extreme eastern end. The estimated cost of the line including bridges, rolling stock and stations is $175,000,000, and the annual expense, including interest at 4 per cent on the capital, is put down at $17,405,000. This will, it is expected, require an annual subsidy of $1,000,000 until the cheaper freights have had time to develop the country. In addition the government intends to transform the Port of Vladivostock, which is the eastern terminus of the line, into a first class fortress, and to provide it with a harbor for the use of the Russian Pacific fleet. It intends to make it a second Sebastopol. From this port fast cruisers will issue to harass the ships and commerce of any nation with which Russia may be at war. The fortifications are now rapidly building, and when completed, the port will be practically impregnable. The government has supplied the authorities of the town with ice breakers, and so the port will be open all the year round.

Universal Time in Germany.

We learn from *Kuhlow's* that the "Mid European," or the time of the 15th meridian east from Greenwich, was adopted in the private service of most of the German railroads on the 1st of June last, and the Bavarian and Wurtemburg roads finding the advantage of the system will shortly introduce it for the public service. The Austrian-Hungary roads adopt the mid-European time in their timetables issued on Oct. 1, for the winter service. It is hoped that this change will become general in Germany and Austria. The late General Field Marshal von Moltke said in his last parliamentary utterances shortly before his death: This system [of local time] has remained over from the time of German disunion; but now that we are again an empire, we could easily dispense with it.

Ontario's Iron Mines.

It is a matter of serious consideration and regret that the extensive iron mines of Ontario are idle. The only one which shipped any ore last year has suspended work. In his recent report to the legislature of the province on the development of the iron industry of Ontario, the Inspector of Mines writes: "From the William mines, situated three miles from the Madawaska station on the Kingston & Pembrooke railroad, and two miles from a siding, has been shipped a quantity of ore. In the eleven months previous to last June 12,000 tons of good magnetic Bessemer ore had been taken out. The average of 65 tons per day was then being raised and carefully sorted and washed. About 7,000 tons of ore were ready for shipment, averaging a grade of 65 per cent. A vein of ore 15 ft. wide had been opened for a considerable distance on the surface, and the principal workings had reached a depth of 100 ft. on an incline of 30 deg. west. A large number of mines of iron have been worked extensively in former years which are now shut down, as the duty of 75 cents per ton on all iron ore shipped into the United States prevents their being successfully operated for shipping purposes. Were this prohibitory tariff removed it is likely that work would be quickly resumed at these rich mines and assume immense proportions. Besides those already opened, extensive new iron ore beds would be operated throughout the counties of Hastings, Addington, Frontenac, Renfrew, Leeds, Granville, Lanark and Carleton. The districts of Muskoka, Parry Sound and Nipissing would also find an outlet for their high grade ore now locked up in these extensive ranges." Sir Richard Cartwright and others who have made the iron question a study urge the Government to engage the services of competent engineers from Sweden to study the mines of the province. "In northwestern Ontario," says the inspector, "the recent prospecting in the district of Thunder Bay and Rainey River has determined that wide ranges of high grade ore abound."

Mr. Richard R. Paulison, of Port Arthur, Ont., who is well acquainted with the mines of western Ontario, writes as follows respecting the Mesabi range, the extension of the celebrated Vermillion and the Attik-Okan ranges: "To the northward from Port Arthur is the Gunflint, Arrow and Whitefish lakes range, a continuation of the Mesabi range, and so far has been traced to Minnesota from a point about six miles southwest of the north of Gunflint Lake, and passes northeasterly, north of Gunflint, Arrow and Whitefish lakes and north of the Canadian Pacific road. The geological formation on this range is highly favorable for the opening up of enormous iron deposits of good merchantable quality. On this range, six miles across the boundary in Minnesota, the Milwaukee Iron Co. opened up its property by trenching and with a diamond drill, and as their formation is precisely similar to that north of the lakes mentioned above, the result they obtained may be interesting, and is about as follows: On the surface they had to go by the geological formation almost entirely, and after throwing aside about 6 ft. of alluvium and rock they uncovered 6 ft. of high grade Bessemer ore. Passing through this they struck 8 ft. of mixed up rock, jasper and iron, and then went through 15 ft. of solid high grade ore, carrying five per cent. of manganese. The same indications have been found at the west end of Gunflint Lake, northeasterly to Kaministiqua station. To the northward also is the continuance of the famous Vermillion range, which has not been explored beyond Hunter's Island, but the deposits are supposed to continue through Shebandowan Lake, northeasterly. The most northerly range so far located is known as the Seine and Attik-Okan range, and numerous discoveries are being made at this point. The deposits on this range are very apparent on the surface, and the ores are of a high merchantable quality. The deposits on these three upper ranges contain hematite and Bessemer ores."

Fell Out of His Cab.

A singular accident happened to an engineman on the Baltimore & Ohio one evening last month. He was running a passenger train from Washington to Baltimore, and rounding the curve at the Relay House he fell out of the cab door. Later he was picked up by his own trainmen, and found to be stunned but not fatally injured.

Listings on the New York Stock Exchange.

The Governing Committee of the New York Stock Exchange has this week listed the following securities:

Illinois Central Railroad.—$500,000 additional capital stock, being part of the $5,000,000 authorized Oct. 8, 1890.

Hannibal & St. Joseph.—$556,000 additional consolidated mortgage six per cent. bonds.

St. Paul, Minneapolis & Manitoba.—$817,000 additional consolidated mortgage six per cent. gold bonds (interest reduced to 4½ per cent. and so stamped), making total amount listed to date $28,288,000, of which $13,344,000 is at six per cent., and $14,944,000 is at 4½ per cent.

Fort Worth & Rio Grande.—$777,000 additional first mortgage five per cent. gold bonds.

Chicago & Northern Pacific.—$4,081,000 additional first mortgage five per cent. 50 year gold bonds.

Cheap Dining Car Service.

The C. B. & Q. on a western train running into Chicago at one P. M., serves a substantial lunch in its regular dining car at 50 cents. This is the cheapest rate yet announced for regular dining car service. The bill of fare is about as follows: Soup, baked potatoes, Irish stew, cold roast beef, baked beans, beef tongue and lamb, sardines, potato salad, assorted cake, preserves, Bent's crackers, cheese, coffee, tea, celery, olives and others relishes. The regular price for dinner and breakfast on the "Q." is 75 cents.

CAR BUILDING.

The Cincinnati, Wabash & Michigan is building two passenger cars at its shops in which will be placed the Wheeler car seat.

The Buffalo Car Co. has just finished a large order for box cars for the Delaware, Lackawanna & Western and 200 box cars for the Fall Brook Coal Co. There are now in construction 100 platform cars and 30 box cars for the Adirondack & St. Lawrence.

The Laconia Car Co. has orders on hand that will give work throughout the winter. Among the contracts is one for 200 cars for the Burton Stock Co. The Laconia establishment has added to its plant a malleable iron department.

The Northern Car Co., of Minneapolis, Minn., has been incorporated for the purpose of manufacturing street cars, railroad cars, locomotives, electric motors, engines, etc. The incorporators are C. P. Jones, D. M. Gilmore, W. E. Steele and S. S. Thorpe, all of Minneapolis. This company is already engaged in the manufacture of street cars and under the new arrangement will increase its business by extending it into branches not already embraced.

BRIDGE BUILDING.

Bellows Falls, Vt.—Westminster people are moving to replace the old Saxton's River bridge with a suspension bridge of iron about 300 ft. long. A special meeting will meet soon and discuss the matter.

Boston, Mass.—The Harbor and Land Commissioners gave a hearing Oct. 28 on the East Boston bridge question. The plan prepared by the City Engineer called for a $2,000,000 bridge, exclusive of land damages. It would be 35 ft. above high water, and two draws, 100 ft. wide, would allow the passage of masted vessels.

Camden, N. J.—The estimated cost of the projected Federal Street bridge is $16,000. The Board of Freeholders will build the bridge if it is finally authorized.

Cincinnati, O.—The Board of Affairs has decided to build a lift bridge over the canal at Liberty Street, and the engineer is preparing plans and specifications.

Edna, Tex.—The county has let a contract for a $4,000 iron bridge to the King Iron Bridge & Mfg. Co. The bridge is to be built over the Lavaca River.

Granite, Idaho.—The contract for the erection of the superstructure of an iron trestle at Granite, Idaho, on the Northern Pacific, has been awarded to the Lassig Bridge & Iron Works, of Chicago. The weight of this iron structure will be about 875 tons, and the bids include erection and painting. The closeness of the bids is noticeable, there being less than $4,500 difference between those of the nine lowest bidders. The following is a schedule of the bids:

	Cents per lb.
Lassig Bridge & Iron Works	3.86
Pittsburgh Bridge Works	3.87
Cofrode & Saylor	3.89
A. & P. Roberts Co.	3.97
Elmira Bridge Co.	4.00
Phœnix Bridge Co.	4.06
New Jersey Steel & Iron Co.	4.1
Keystone Bridge Co.	4.1
Detroit Bridge & Iron Works	4.125
Union Bridge Works	4.3
Passaic Rolling Mill Co.	4.91

Hampton, N. B.—The new steel bridge which the local government has erected at Hampton, N. B., is nearly completed, and it is expected will be open for traffic early this week.

Kampville, Ill.—Secretary Grant has approved the plans submitted by Capt. W. L. Marshall, engineer of the Litchfield, Carrollton & Western Railroad, for the proposed bridge over the Illinois River at this place.

Newport, R. I.—The United States Engineer in charge at Newport has received official orders from Washington to compel the Old Colony Railroad Company to widen the drawbridges at Taunton, Mass., and Tiverton, R. I., to the measurement of 100 ft., so as to permit the passage of all classes of shipping.

Philadelphia.—I. H. Hathaway & Co. are building a new bridge over the Frankford Creek, at the entrance to Frankford. The cost will be about $45,000. The new bridge will be about 60 ft. in width, and about 200 ft. in length, supported by two stone piers in the bed of the creek, and steel-decked. The floor of the bridge will be laid with a bed of concrete, and paved with Belgian blocks. Each side will have a footway nine ft. wide. The remainder of the centre is set aside for the car tracks.

Rochester, N. Y.—The division engineer at Rochester has received from the state engineer's office of New York plans for the Rowe street lift bridge, the contract for which is to be let Nov. 9. The total length of the structure will be 93 ft. 4 ins. and the bed 70 ft. The width of the roadway from centre to centre of trusses is 22 ft. The appropriation for the bridge is $15,000 and it is to be finished before next spring.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of the United States rules that the term "wages of employes," decreed to be paid by the receiver in forcclosure proceedings out of the income of a railroad, does not include the services of counsel employed for special purposes. Where there are no surplus earnings; an attorney who recovers for a railroad, in the hands of a receiver, engines formerly leased by it another road, and rent for their use, is entitled to a reasonable compensation, to be paid out of the *corpus* of the property, as the benefit of the recovery inured to the security holders. But he is not entitled to compensation for advise to parties interested who advance money to keep the road going, nor for services prior to ths road going into the receiver's hands.[1]

In New Jersey the Supreme Court rules that under the act to authorize the formation of railroad corporations and regulate the same and its supplements, a railroad less than a mile in length may be built, and an independent company may be organized to build a railroad which will connect two existing railroads.[2]

In Georgia the Supreme Court holds that a condition in a grant of land to a railroad company, that it shall be used "for shops, depots, and other conveniences and fixtures necessary for said company," is not complied with by a use of the land for the building and maintenance thereon of a track or tracks for the purpose of conveying freight to private parties, the storage of cars, and other like uses.[3]

Carriage of Goods and Injuries to Property.

In Texas it is held by the Supreme Court that a provision in a contract of shipment that any action thereon must be brought within 40 days after the damage shall have occurred is waived where defendant carrier, by promising to pay plaintiff's claim, if made for a reasonable amount, induces him to delay bringing suit until after the expiration of the 40 days.[4]

In the same state it is held that a shipper is not justified in refusing to receive goods carried for him by rail because one of a number of boxes is missing, and, the goods tendered having been sold according to law to pay freight and storage charges, he cannot recover their value.[5]

In Wisconsin a fire originated through defendant's negligence 2½ miles north of plaintiff's land, and several days afterward his property was burned. In the meantime other fires had been started north and east of his land to prevent the first fire's spreading. The Supreme Court decides that, to render defendant liable, the first fire must be directly connected with plaintiff's loss. A rise in the wind after the fire started, causing it to spread to plaintiff's land, releases defendant from liability.[6]

But in a Virginia case the Supreme Court rules that where, after a fire is negligently started by a railroad company, a high wind arises, causing it to spread and destroy adjoining property, the fire is the proximate cause of the injury.[7]

In Kansas the Supreme Court holds that in an action against a railroad company for failing to construct cattle guards where the road enters an inclosure, the land owner may recover for the damages to his crops by trespassing animals, and also for the services of himself and family in guarding the crops to prevent further damage.[8]

In New York the Supreme Court rules that the existence of peculiar benefits is to be proved, and the fact that there was no diminution in the rental value of the premises by maintaining an elevated road but a steady increase, does not show that the lessening of air and light, and of convenience of access had not a hurtful effect upon the rental value.[9]

The Supreme Court of Missouri rules that where a railroad condemns a right of way across defendant's lot in such a way as to separate his engine from his mining shaft, defendant is entitled to compensation in money, and cannot be required to accept in lieu thereof licenses and privileges to go upon and use the right of way, or a release of part of it.[10]

In New York the Supreme Court decrees that one who holds the legal title to real property, although another is a partner with him therein, may maintain an action in his own name, as the real party in interest, for injuries to the property from the construction and operation of an elevated railroad; and his recovery will not be limited to an undivided half interest in the damages sustained.[11]

In Louisiana the Supreme Court holds that in a suit to expropriate property for the purpose of building a railroad, damages on account of smoke, noxious vapors and loud jarring sounds emanating from and caused by the engines and rolling stock of plaintiff, are not decreeable.[12]

Injuries to Passengers, Employes and Strangers.

In Louisiana a commutation ticket entitled any member of a firm to travel thereon on certain terms, among which was a condition requiring them to sign their names on the back, and another providing that the ticket should be good only for the persons named hereon. The Supreme Court rules that the ticket was not good for a member of the firm who had not indorsed it.[13]

The Supreme Court of North Carolina holds that a railroad commits a tort and becomes liable for punitive damages in wilfully failing to stop for passengers at a regular station; and cannot escape liability on the ground that there was not sufficient room in the train, if it appears that by reasonable diligence it might have provided extra cars.[14]

In Massachusetts the Superior Court holds that the calling of the station and opening and fastening back of the car door by defendant's brakeman was not an invitation to plaintiff, a passenger, to step off a moving train, and the failure of brakeman to warn plaintiff not to step off a moving train did not amount to an assurance on the part of defendant that it was safe to alight before the cars stopped.[15]

In a case in the Federal Court the deceased and other employés of defendant railroad company had borrowed a car and engine for their own purposes, by permission of defendant's yardmaster, and in the negligent management thereof plaintiff's intestate was killed. The Court decides that the relation of carrier and passenger did not exist, and plaintiff cannot recover.[16]

In Minnesota the Supreme Court holds that a master is not liable to his servant for injuries received from the latter's use of a defective tool, where the defects therein were obvious, and like tools in proper condition were furnished by the master, which the servant might have used had he chosen to do so; and this though the servant was but 17 years old.[17]

In New York it was shown that the train dispatcher directed the telegraph operator at P. to "flag and hold train No. 1." The operator supposed that No. 1 was to be held for No. 2, and when No. 2 was out of the way he took down the red flag, which was the signal to stop, and No. 1 passed beyond P. and collided with No. 6, killing plaintiff's intestate. There was uncontradicted evidence that the operator had had a year's experience, was a first-class operator, and had discharged his duties intelligently and satisfactorily to defendant during the three months that he had been in its employ. The Court of Appeals rules that it was error to submit to the jury the question of his competency because he was but 17 years old, there being evidence that young men are usually better operators than old ones.[18]

In Alabama the Supreme Court holds that in an action for an injury suffered while working on a car on the repair track, evidence that a one-armed yardmaster acted as brakeman on a car about to be moved on to the repair track, and that by reason of his physical incapacity, he was unable to fix the brake in time to prevent the collision, warrants a verdict in plaintiff's favor, as it was the yardmaster's duty to put a competent and physically capable brakeman on the car about to be moved.[19]

In Colorado the Supreme Court rules that a brakeman who has his hand crushed while attempting to couple in the dark two cars with drawheads at an unequal height from the track, can recover for his injuries, where the company had failed to furnish suitable links for such couplings, and the conductor ordered plaintiff to take the unsuitable link with which he attempted to make the coupling.[20]

In the Federal Court it is held that it is not negligence on the part of a railroad company to have switches without lights on them in its yard, unless it appears that it was the common and uniform practice to have such lights, and that the switchmen had a right to expect them.[21]

In Maryland while the defendant was rightfully crossing the track in front of defendant's freight train there was a sudden escape of steam from the safety valve of the engine that frightened her horse, and caused him to throw her. It was shown that the valve was gauged to allow an escape of steam when it reached a certain pressure, and that it required a full head of steam to move the train on the grade where it was standing. The Court of Appeals decided that the defendant was not guilty of negligence rendering it liable for plaintiff's injuries.[22]

The Supreme Court of New York holds that it was culpable negligence in an engineer, after having seen plaintiff in a dangerous position on the track, to back down upon him without looking again to see if he was out of the way.[23]

In Michigan the Supreme Court holds that a woman who, in order to take an incoming train, endeavors to climb over the couplings between two cars of a freight train, with engine attached, standing across a highway, and is killed by the sudden starting thereof, is guilty of gross contributory negligence. And the fact that the company's employés have frequently assisted persons to pass under and between its cars cannot be considered an invitation to do so.[24]

[1] L. E. & Str. L. R. Co. v. Wilson, 11 S. C. Rep., 405.
[2] Nat. Docks & N. J. J. C. Ry. Co. v. State, 21 Atl. Rep., 570.
[3] Georgia R. & B. Co. v. City of Macon, 13 S. E. Rep., 21.
[4] Gulf, C. & S. F. Ry. Co. v. Trawick, 15 S. W. Rep., 568.
[5] Gulf, C. & S. F. Ry. Co. v. Booton, 15 S. W. Rep., 502.
[6] Mauris v. C. M. & St. P. Ry. Co., 47 N. W. Rep., 1,123.
[7] Tyler v. Ricamore, (Va.) 12 S. E. Rep., 799.
[8] M. P. Ry. Co. v. Ricketts, 26 Pac. Rep., 50.
[9] Herold v. Metropolitan El. Ry. Co., 13 N. Y. S., 640.
[10] Chicago, S. F. & C. Ry. Co. v. McGrew, 15 S. W. Rep., 931.
[11] Korn v. New York El. R. Co., 13 N. Y. S., 514.
[12] N. O., Ft. J. & G. I. R. Co. v. Barton, 9 South Rep., 19.
[13] Granier v. Louisiana W. R. R. (La.), 8 South Rep., 614.
[14] Purcell v. R. & D. R. Co., 12 S. E. Rep., 954.
[15] England v. B. & M. R. Co., 27 N. E. Rep., 1.
[16] Davis v. C., St. P., M. & O. R. Co., 45 F., 543.
[17] Hefferen v. Northern Pac. R. R. Co., 48 N. W. Rep., 1.
[18] Sutherland v. T. & B. R. Co., 46 N. E. Rep., 609.
[19] L. & N. R. Co. v. Davis, 8 South Rep., 552.
[20] D., T. & G. R. Co. v. Simpson, 26 Pac. Rep., 239.
[21] Grant v. Union Pac. Ry. Co., 45 Fed. Rep., 873.
[22] Duvall v. Baltimore & Ohio R. R. Co., 21 Atl. Rep., 496.
[23] German v. Suburban Rapid Transit Co., 13 N. Y. S., 897.
[24] Bird v. Flint & P. M. R. Co., 48 N. W. Rep., 691.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

New York, Providence & Boston, quarterly, 2½ per cent., payable Nov. 10.

Old Colony, quarterly, $2.90 per share, payable Dec. 1.

Pennsylvania, semi-annual, 3 per cent., payable Nov. 30.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Baltimore & Ohio, annual, Baltimore, Md., Nov. 16.

Boston, Revere Beach & Lynn, annual, Boston, Mass., Nov. 19.

Boston, Winthrop & Shore, annual, Boston, Mass., Nov. 19.

Buffalo, Rochester & Pittsburgh, annual, 36 Wall street, New York City, Nov. 16.

Cleveland & Pittsburgh, special, Cleveland, O., Nov. 18, to vote upon a proposed issue of bonds.

East Tennessee, Virginia & Georgia, annual, Knoxville, Tenn., Nov. 18.

Grand Trunk & Georgian Bay, annual, Simcoe, Ont., Nov. 10.

Manhattan (Elevated), annual, 71 Broadway, New York City, Nov. 11.

Memphis & Charleston, annual, Memphis, Tenn., and Huntsville, Ala., Nov. 30.

New York & Northern, annual, 32 Nassau street, New York City, Nov. 11.

New York, Lake Erie & Western, annual, 21 Cortlandt street, New York City, Nov. 24.

Suspension Bridge & Erie Junction, annual, 21 Cortlandt street, New York City, Nov. 24.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m, on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

Engineer's Club of Cincinnati.

At the September meeting of the club, Mr. A. O Elzner read a paper entitled "Engineer and Architect." He called attention to the intimate relations between the professions and the difficulty sometimes to know where to draw the line, and noted in this connection that many of the magnificient ancient works of so-called architecture certainly combined in their construction the ability of both the engineer and the architect.

The professions must evidently depend upon each other for assistance in carrying out many of the large works of the present time, else an architect must be an engineer or an engineer combine the qualifications of the architect. This is illustrated in the fact that the Board of Architects of the World's Fair Buildings at Chicago simply design and determine exteriors for the various buildings, while the work of preparing detailed plans, specifications, the necessary calculations and the construction are all in the hands of a separate Engineer Department. Many of the improvements and much of the economy in the construction of the present day are due to the assistance of each profession to the other. Incidental to the paper was a reference to and general description of the construction of the tall modern buildings of iron or steel framing encased in brick or terra cotta. Mr. Elzner exhibited the plans of the Neave building, which is of such construction.

Master Car Builders.

The Arbitration Committee of the Master Car Builders' Association has published minutes of the meetings held in Chicago, Oct. 16 and 17, regarding cases 88 to 99. The decisions relate to the following: Value of furniture car destroyed; wrong drawhead replaced by a railroad company as agent for the owner; responsibility for lost retaining valve; wrong drawbar replaced by owner's agent; car damaged on private track; age of car destroyed and rebuilt or generally repaired; responsibility for "defect card" issued erroneously by joint inspector; card declined by delivering road on account of defects being old; point of delivery of trucks returned from car destroyed; M. C. B. axle used in place of a standard ¾ in. shorter between journal centres; responsibility under irregular card used; brasses missing and damage caused thereby.

New England Railroad Club.

The regular meeting of the club will be held at the United States Hotel, Boston, Wednesday, Nov. 11, 1891, at 7:30 P. M. The subject for discussion is the care of steam heated cars at terminal points.

The Civil Engineers' Club of Cleveland.

A regular meeting was held at the Club Rooms on Tuesday evening Oct. 9, with President Gobeille in the chair and 42 members and visitors present. Mr. J. F. Halloway was elected an honorary member and Messrs. W. H. Stair, A. W. Johnston and J. C. Beardsley were elected active members.

Mr. C. W. Barber reported on the prospect for new club rooms. Prof. C. H. Benjamin made a report on the recent visit of the club to The Walker Manufacturing Co.'s works, describing some of the more novel machines and some of the large pieces of work now in process of construction at these works. Mr. John Walker also gave a description of some of the large pieces of work now building for cable railroads, and he also described the construction of their furnace, by which they are enabled to melt more iron per pound of coke than almost any other furnace of the size in the country. Mr. W. P. Rice gave a report of the club's visit to the Globe Iron Works Co.'s shops and ship yard.

The paper of the evening was by Mr. E. P. Roberts, entitled "The Incandescent Electric Lamp, from the standpoint of the electric light manager and of the customer." He exhibited a number of curves showing the life of the lamp when used with different currents and the relative cost of lamps of different candle power.

Prof. C. S. Howe read a short paper on "A New Method of Computing Areas in Land Surveying," by which it is claimed much time is saved over any of the methods now in use.

Western Society of Engineers.

The Western Society of Engineers (Chicago) had under consideration at its last meeting the foundations and floors of the buildings at the World's Fair. The subject was introduced by a paper read by Mr. A. Gottlieb. The paper was well discussed and has excited much interest.

PERSONAL.

—J. F. Sessions, Walter McGaurin and J. H. Askew, Railroad Commissioners of Mississippi, were re-elected at the election last Tuesday.

—Mr. Stevens Thomas, of Athens, Ga., one of the projectors of the Georgia Railroad and for many years a director of the company, died in Athens last week.

—Mr. E. W. Coombs, who resigned as General Freight Agent of the Allegheny Valley Railroad about a month ago on account of ill health, died at his home in Oakmont, Pa., Oct. 26. Mr. Coombs held that position several years.

—Mr. J. C. Weld, Superintendentof the Ultima Thule, Arkadelphia & Mississippi road, was killed in a wreck on the road near Arkadelphia, Ark., Oct. 30. The caboose in which Mr. Weld and several passengers were riding was derailed and thrown down an embankment.

—M. Ernest Chabal, Mechanical Engineer of the Paris, Lyons & Mediterranean Railroad, with other officers of the company, is in America for the purpose of studying American railroads and railroad shops. They will visit various locomotive works and rail mills, the Altoona shops of the Pennsylvania and other shops in various cities, going as far West as Chicago.

—Mr. William M. Parker, one of the most prominent railroad men in New England, died at Manchester, N. H., last week, aged 70 years. He had been in the railroad service since 1841, having been Assistant Superintendent of the Hudson River R. R.; Superintendent of the Northern of New Hampshire; General Superintendent of the Boston, Hartford & Erie (now the New York & New England); Passumpsic; Boston & Lowell, and Connoughton Valley in Ohio. He leaves a widow, daughter and three sons.

—The employés of the Chicago & Northwestern mechanical department have contributed $1,500 for a monument for the late Mr. George W. Tilton, formerly Superintendent of Motive Power of the road. The subscription list was made by the engineers, firemen and mechanics of the workshop. The amount given was limited to $1 each. The monument will be erected in Rose Hill Cemetery, Chicago, and is made of granite, beautifully polished and suitably inscribed.

—Mr. H. M. Sperry, for the last five years Supervisor of Signals of the New York Division of the Pennsylvania Railroad, has been appointed General Agent of the Johnson Railroad Signal Co., and will have his office in Chicago. Mr. Sperry has been on the Pennsylvania for ten years, and is one of the most accomplished signal engineers of our acquaintance. His field has been important and exacting—this division being the most perfectly signaled road of anything like equal length in the United States—and he has filled the position with conspicuous care, skill and conscientiousness. He goes to Chicago Dec. 1.

—Colonel Samuel H. Lockett died at Bogota, United States of Colombia, Oct. 12. He had recently taken service there as chief engineer of the water-works. Colonel Lockett was a man of many accomplishments outside of his profession, and professionally he had unusual attainments and ability. He was a graduate of West Point, and served in the United States army before the war. Being a southerner he went with his State, and was an engineer officer in the Confederate service during the war. He was largely responsible for the fortification of Vicksburg, if indeed the scheme of fortification was not entirely his own, and how well he did that work has long ago become a matter of history. After the war he spent more or less time as professor of engineering in one of the Southern colleges, and in 1876 or thereabouts, entered the Egyptian service with the rank of Lieutenant-colonel. He was in Abyssinia with the unfortunate expedition which was nearly annihilated through the incompetence of the Turkish and Circassian officers in command, and the courage and energy of the Abyssinians; and he spent a good deal of time as Chief of the Engineer Bureau of the War Department at Cairo. He returned to the United States about 1879 or 1880, and was associated with General Stone as engineer in building the pedestal of the Statue of Liberty in New York harbor. Since that time he has made several expeditions to South America and Central America, having examined for the North & South America Construction Co. the projected railroad lines in Chili, an account of which he wrote for the *Railroad Gazette*.

With his professional attainments and varied accomplishments and tastes Colonel Lockett was a man of charming personal qualities and singularly modest. It is probably largely because of the predominance of this last element in his character that he was not more widely known, but he was much endeared to those who knew him well.

—John Marston Goodwin, C. E., of Sharpsville, Mercer Co., Pa., died there on the night of Oct. 27, aged 57 years. He was the oldest child of Col. J. M. Goodwin, for many years at the head of the Massachusetts General Hospital, and of Emmeline C. Philleo, his wife, who in later life, as Mrs. C. A. Whipple, was matron of several important charities under the direction of Dr. S. G. Howe.

From these parents Mr. Goodwin inherited a careless indifference to the accumulation of property, a strong predilection for philanthropical enterprises, a warm poetical temperament and a love of art and literature. He had an excellent mechanical talent, and made several valuable inventions; he had also remarkable attainments as a statistician. He wrote many lovely verses, most of which were seen only by his friends, but some of them were published in the *Dial* and elsewhere. He was a frequent contributor to the *Railroad Gazette*, and other technical journals.

Mr. Goodwin was born in Boston and educated there. In 1849, at the age of 15, he entered the engineer corps at St. Albans, Vt., then engaged in constructing a division of the Vermont & Canada Railroad, remaining until the road was completed; thence he went to the Champlain & St. Lawrence Railroad, in Canada. In 1856 he was employed on the Beaver Dam & Baraboo Railroad in Wisconsin, and afterward joined the frontier exploring corps of the La Crosse & Milwaukee Railroad, penetrating the then wilderness of Minnesota. Subsequently he was connected with the Michigan Southern & Northern Indiana Railroad, living for some years at Toledo, O., where he married the wife who survives him.

During the war of the rebellion he was engaged with Col. Thomas A. Scott and P. T. Watson upon enterprises in Kentucky; and when later Mr. Watson became president of the Erie he selected Mr. Goodwin for a confidential assistant. From the Erie Mr. Goodwin went to the Sharpsville Railroad, of which he was for a long time, and until it was absorbed by the Baltimore & Ohio, the Chief Engineer. His latest service as an engineer has been as a prominent and efficient member of the Pennsylvania Commission to lay out a canal between Lake Erie and Pittsburgh, the report of which commission, in large part prepared by him, a very valuable document, appeared this year.

Mr. Goodwin became a member of the American Society of Civil Engineers in 1872. He was twice married, his first wife dying early, leaving no children. Two sons and two daughters by his second marriage are living.

ELECTIONS AND APPOINTMENTS.

Alliance & Northern.—W. D. Winans has been appointed Assistant General Freight and Passenger Agent, with headquarters at Alliance, O.

Central Massachusetts.—The following directors were elected at the annual meeting of the stockholders in Boston, Mass., Oct. 28: S. N. Aldrich, Marlboro; Thomas H. Perkins, Henry Woods, William T. Parker, and Moses Richardson, Boston; Elisha S. Converse, Malden; Charles E. Sweet and Charles P. Darling, Newton; William M. Gaylord, Northampton, and J. Edwin Smith, Worcester, Mass.

Chesapeake & Ohio.—Edward H. Bacon has been appointed Southern Passenger Agent of the road to succeed C. Buetgenbach, who recently resigned. His office will be at 253 Fourth avenue, Louisville, Ky.

Chicago & Eastern Illinois.—Thomas Anderson has been appointed Master Car Builder, with headquarters at Danville, Ill.

Chicago, St. Paul & Kansas City.—J. J. McLaughlin has been appointed Superintendent of Terminals, with headquarters at St. Paul, Minn.

Davenport & Rock Island.—J. F. Gardner, for several years past connected with the treasurer's office of the Central Union Telephone Co., in Chicago, has been elected Secretary and Treasurer of this road, with headquarters at Davenport, Ia.

Lake Erie, Alliance & Southern.—W. D. Winans has been appointed Assistant General Freight and Passenger Agent of the company, with office at Alliance, O.

Lake Erie & Western.—The office of Assistant General Superintendent has been created and George T. Jarvis has received the appointment. Mr. Jarvis has been in the employ of the Pennsylvania company, Mexican Central and Baltimore & Ohio roads in various capacities in the past 15 years. George T. Jarvis has been appointed Assistant General Superintendent of the road.

Mason City & Fort Dodge.—R. H. Emerson has been appointed Master Mechanic of the road, with headquarters at Fort Dodge, Ia., vice Bernard Reiley, resigned.

Missouri, Kansas, & Texas.—The general offices of the company have been removed to Parsons, Kan., the laws of that State requiring a company operating a railroad in Kansas to maintain its general offices in the State. The offices of the General Superintendent, Master of Transportation, General Passenger Agent, General Freight Agent, Auditor, Freight Claim Agent, Treasurer, and General Solicitor. Offices will still be maintained at Sedalia, Mo.

Pan American (Texas).—The following are the directors of this company named in the charter filed in Texas last week: J. S. Anthony, George H. Towle, Boston; J. M. Cropley, J. B. Wells, W. B. Hopkins, George Vineyard, R. J. Kleberg, R. W. Stayton and William Davis, Galveston, Tex.

Reading, Lancaster & Baltimore.—The incorporators are: H. C. Lehman, J. B. Martin, J. A. Burger, S. Clay Miller, C. B. Lehman, H. C. Lehman, Lancaster, Pa.; E. Billingfeet, Adamstown; D. R. Brewer, New York: J. F. Ingram, Strasburg, Pa. The President is H. C. Lehman.

Richmond & Danville.—The jurisdiction of M. C. Figg, Auditor of the Richmond & Danville, has been extended over the Central Railroad of Georgia's leased and controlled rail lines. All reports heretofore addressed to the Comptroller or the Acting Auditor at Savannah, Ga., should be addressed to the Auditor at Atlanta, Ga. H. C. Ansley, Acting Auditor, has been appointed Assistant Auditor. That portion of the Port Royal & Western Carolina railroad between Greenville and Laurens, S. C., was on Nov. 1 placed under the control of J. A. Dudson, Superintendent, with office at Columbia, S. C.

Roanoke & Southern.—A. P. Warrington has been appointed Traffic Manager, with temporary office at Winston-Salem, N. C.

Saltair.—The following officers have been elected by this company: George Q. Cannon, President; Joseph F. Smith, Vice-President; N. W. Clayton, Treasurer; L. A. Clayton, Secretary; C. W. Hardy, Engineer, and N. W. Clayton, Manager. The office of the company is at Salt Lake City.

Sioux City, O'Neill & Western.—This is the new name of the Pacific Short Line. The incorporators are: Arthur S. Garretson, F. C. Hills, J. C. Coombe, Flower A. Sesman, Craigh L. Wright, William H. Goodwin, George W. Seevers and George Wickersham.

South Bound.—Wm. P. Epperson, formerly Superintendent of the Central of Georgia, has been appointed Master of Transportation of this road.

Union.—The following are the officers of this new road: President, Samuel Tate, Jr.; Vice President, John K. Speed; Secretary and General Manager, John C. Rogers; Treasurer, Napoleon Hill; Chief Engineer, E. L. Corthell, and Resident Engineer, James L Armstrong The general offices of the company are at Memphis, Tenn.

Union Pacific.—J. N. Brown, formerly Chief Clerk of the passenger department, has been appointed Acting Assistant General Passenger and Ticket Agent, vice J. W. Scott, resigned.

RAILROAD CONSTRUCTION,

Incorporations Surveys, Etc.

Abingdon Coal & Iron.—The last seven miles of the grading on this road between Abingdon and Damascus, Va., has been let to W. P. Fortune & Sons, of North Carolina. The line is about 15 miles long, the first eight miles having been graded during the summer. J. C. Matson, Jr., is Chief Engineer. The general office is at Abingdon, Va.

Belmont, Northern & Northwestern.—This company has started construction work upon its line through Ontario from Belmont on the Canadian Pacific, about 150 men being employed at the start.

Buffalo & Geneva.—The track east of Buffalo is laid to a point beyond Caledonia near Shortsville, N. Y. The bridge east of this point has just been erected and the track laid across it, practically completing the tracklaying as the rails have been laid except for a short distance, from Geneva west to the Genessee River. It is possible that trains will be running between Buffalo and Geneva before Jan. 1, although the officers have not contemplated opening the line as early as that date. The road-bed is complete on the Honeoye branch to Rochester, N. Y., from the main line to Mount Hope, and work is progressing rapidly on the mason work for the crossing of the branch. The abutments for the bridge across the Genessee River are also well advanced and it will be easy to put the bridge across The bridge across the Genessee will be the last link required to complete the line. A corps of Lehigh Valley engineers is surveying for an extension of the line from Red Creek to Hemlock Lake,

Buffalo & Susquehanna.—The grading will be finished on about seven miles of this road from Galeton, Pa., this fall. The line has been located for that distance and is now under construction. The contractor, D. Craig, has about three miles of the road completed. At present only about 80 men are working on the construction. The grade does not exceed 50 ft. to the mile, and there is only one bridge 100 ft. long. The terminus of the line will be at Cherry Springs, 12 miles from Galeton. A small tunnel may be necessary on this last section.

Chicago & Eastern Illinois.—The bridge on the Shelbyville extension over the Okaw River between Shelbyville and Sullivan, Ill., will be completed this
The track which has been laid from Sullivan to the river and will now be laid across it. The extension will be completed and trains running to Thelbyville before December.

Cleveland, Cincinnati, Chicago & St. Louis.—The grading on the long projected branch to Richmond, Ind., will probably be commenced this or next week. The work will begin at Cedar Grove, on the White Water division near the state line dividing Ohio and Indiana. The route on which it is now proposed to build follows Cedar Creek, and passes through Mt. Carmel to Richmond, 41 miles.

Colorado & Northeastern.—The survey of this road from Pueblo to Kit Carson, in Cheyenne County, Col., was begun early this year by H. R. Holbrcok, of Pueblo. The engineers have carefully located 120 miles of road from Pueblo, Colo., in a northeasterly direction, and have also a line located from Pueblo southward 55 miles to the coal fields. The main object of the enterprise is to supply Kansas and Nebraska with cheap coal. The grades eastward are 0.3 per cent. and westward 0.6 per cent. The company has not begun any actual construction work, but, writes an officer, "Everything is ready, except the money."

Denver & El Paso.—Horace G. Ropes is organizing a party of engineers to make a survey for this road between Las Vegas and White Oaks, N. Mex. The surveyors will probably start out this week. This line is a division of the proposed road between El Paso, Tex., and Trinidad and Denver, Col., over 400 miles. At a recent convention at El Paso of business men from the towns along the proposed route an organization was effected and a survey of the route ordered to be made. The cost of this work will be borne by the various towns. O. L. Houghton is General Manager of the Las Vegas Division. A. McClelland, of Pueblo, is President of the Executive Committee, and A. H. Whitner, of Las Vegas, Secretary.

Denver, Lakewood & Golden.—The rolling stock of the company has arrived at Denver, and the line between Denver and Golden, Colo., will be opened for freight traffic this week.

Grand Trunk.—This company is constructing an extension from the Chemung Railroad to the Blythe mills in Western Ontario.

Great Northern.—An officer of the road says there is nothing to delay tracklaying until the tracklayers reach the large bridge across the Flathead River, west of Crossport, Idaho. They will be across the Middle Fork in two weeks, and are going ahead at the rate of two miles a day. Some delay is experienced at the bridges because of a lack of timbers, but the track will be in Kalispell, Mont., by Dec. 1.

Greenfield & Northern.—The officers have decided to make a survey south of Mt. Vernon, Mo., to the St. Louis & San Francisco, and three towns are competing for the honor of being the terminus of a proposed road. Citizens of Aurora last week visited the General Manager and offered a subsidy for the extension. Aurora is 10 miles south of Mt. Vernon; Pierce City, 19 miles, and Monett, 15 miles. T. A. Miller, of Greenfield, is General Manager.

Hoosac Tunnel & Wilmington.—The branch of this road from Readsboro, Vt., north to Wilmington, Vt., recently completed, was formally opened Nov. 3 and 4 by excursions to North Adams and neighboring towns. Work was commenced on the extension May 20 last, and with a force of 250 men and teams has been rapidly pushed to completion. The branch is expected to more fully develop the lumbering business in this portion of the state, especially the hard wood trade. Also to make valuable the many fine mill sites along the Deerfield River, which the railroad follows from Hoosac Tunnel to Wilmington.

Jacksonville Southeastern.—The survey being made to Rock Island, Ill., mentioned last week, is for an extension of the Chicago, Peoria & St. Louis from Havana to the Mississippi River at Rock Island. The survey is a preliminary one, and has been made through Galesburg toward Rock Island. The engineers will probably complete the survey in a short time, but it is not yet decided when the line will be located.

Lehigh Valley Terminal.—The general mortgage of this company for $10,000,000 on the New Jersey lines to New York Harbor was recorded in Newark, N. J., last week. It was in favor of the Central Trust Co. of New York, to secure bonds which mature Oct. 1, 1941. The mortgage covers the railroad's leased lines—the Roselle & South Plainfield, Newark, Newark & Roselle, Jersey City Terminal, Newark & Passaic, Newark & Western, and Edgewater lines, and also all the real estate and rolling stock of the line.

Missouri Pacific.—Only 15 miles of the new Omaha cut off, between Union and Plattsmouth, Neb., has been put in operation, although the track was laid north of the latter town to South Omaha early in the spring. The line connects with the Omaha belt line at Postal and it is believed that arrangements will soon be made to place the entire line in operation. It is said that the cut off will shorten the distance between St. Louis and Omaha by about 25 miles. The line crosses the bridge of the Burlington & Missouri River at Plattsmouth, but has not been operated north of Plattsmouth on account of a misunderstanding between the two roads regarding the bridge.

Navesink.—The Central Railroad of New Jersey has concluded negotiations for right of way for the new line from New York to Long Branch, N. J., via the north shore of the Navesink Hills. The route will be by boat to Atlantic Highlands, where a railroad pier will be built out into the Raritan Bay, 1,600 ft. A new road will be built eastward, along the shore, to the mouth of the Shrewsbury River. The river will be crossed by a drawbridge, and the former Long Branch Road on Sandy Hook will be reached at Seabright. The land for terminals has been bought at Atlantic Highlands, and the bridge structure is ready to be put up. The company expects to begin grading this fall. The entire line is to be finished by April next.

New Roads.—A correspondent at Madison, Ind., writes as follows in reference to the proposed revival of the project to build from Madison on the Ohio River to Lexington: "About six years ago some gentlemen in this city and in Kentucky organized a company and obtained a charter from the Kentucky legislature to build a railroad from here to some point south in Kentucky. About the same time a bridge company was organized to bridge the Ohio at this point. Nothing whatever has been done except to make a horseback survey."

The railroad being built through Upshur County, Tex., from Gilmer, by the Tyler Star Lumber Co., will be used for the lumbering business of the company at first. It will be five miles long, and about 2½ miles has been completed. The five miles now being constructed will reach yellow pine timber, owned by the Lumber Company. The contractors are Long & Allen, of Gilmer. The maximum grade on the line now under construction is 1.8 per cent., and the curve six degrees. There is little bridge work, except a 1,200 ft. trestle. H. D. Milton is General Manager, and L. W. Wells is Chief Engineer.

James Taylor, of Byron, Ga., will begin the survey of a railroad this week, from Byron to Taylor, in Crawford County, Ga., a distance of eight miles. He contemplates extending the road to some point on the Atlanta & Florida road, probably Knoxville. C. W. Murray, of Fort Valley, will have charge of the survey. The route contemplated is a very level one, and but little grading will be required.

A syndicate, which includes Judge Bond and F. W. Dunn, formerly Superintendent of the Seattle, Lake Shore & Eastern, will, it is said, build a railroad up the Skagit from a point east of Anacortes, Wash., to transport the ore from the mining districts to the smelters, which are to be built at some point in the valley. The Oregon Improvement Co. has been asked to extend its line from Hamilton via Sauk City to the mines.

The railroad of the Tyler Car & Lumber Co., which extends from the Houston East and West Texas Railroad, near Lufkin, Tex., to the Tyler Southwestern at Durst, is nearing completion, and will be soon put in operation. A considerable number of men have been employed through the summer in constructing the line.

The Blue Cañon Coal Co. is securing the right of way to build a railroad from its mine to Whatcom, Wash., for the transportation of coal to the bunkers, which will be located on Bellingham Bay, in Whatcom County.

Engineers after examining the ground lying between Honesdale and the Erie & Wyoming Railroad, at Hoadley's, a distance of five miles, report the route a good one. A road can be easily built, and when built will shorten the distance between Honesdale and Scranton 10 miles.

Norfolk & Western.—The length of the Ohio extension through West Virginia is about 190 miles, and the grading and masonry of almost the entire distance is nearly completed. The track has been laid and ballasted for something over 70 miles, and this part of the line will be in operation about the first of the year. The company expects that 60 miles additional will be completed by March 1 of next year, and the remaining 60 miles, completing the undertaking, will be completed not later than Aug. 1. The bridge over the Ohio River at Kenova, W. Va., will be completed within the next two weeks.

Northern Pacific.—The double track between Tacoma and Puyallup, on the Cascade division of this road, is to be completed by Nov. 10.

Ogden & Hot Springs.—This railroad, which was built last year from Ogden to Hot Springs, Utah, 7½ miles, was sold, together with the hotel and other real estate and property owned by the company, for $57,000 at foreclosure sale at Ogden, Utah, Oct. 23. The property was bid in by W. A. Paxton, of Omaha, the President of the road.

Pawnee.—The work of grading for the extension of the road from the crossing of the Jacksonville Southeastern, between Divernon and Glenarm to Auburn, Ill., was begun last week, and it is expected to have the road in operation within two months. The Chicago & Alton has taken $20,000 worth of the company's bonds, and it is generally believed here that the Alton will shortly purchase the new road, extend it westward to Roodhouse, and save several hours' time between Springfield and Kansas City.

Pennsylvania.—A party of surveyors are running a line for a short branch through McKeesport to the Youghiogheny River to a new rolling mill site at Cedar Creek. The line will be about four miles long, beginning at Sewickly.

Pennsylvania & West Virginia.—The New England Trust Co., of Boston, this week entered a mortgage in the Recorder's Office of Blair County, Pa., against the company. The mortgage is for $1,000,000, and is a lien on the road, which is 50 miles in length and is to extend from Mann's Choice, Bedford County, to Brook's Mills, Blair County. Work on the line was begun last week at a point on the Pennsylvania road above Bedford. It will be first built to Brook's Mills. C. F. Hobart, of Vermont, is building the line. The construction headquarters are at Bedford, Pa. Philip E. Chapin, of Washington, D. C., is President.

Philadelphia & Reading.—A survey is being made for a branch from near Philadelphia to the suburban section of Frankford, to the northeast of the city. The survey is being made by the residents of Frankford, and the profiles and reports of the engineers will be turned over to the officers of the Reading, and it is expected that the company will agree to build the branch. The route crosses Wingohocking street, and follows the line of Unity street to Frankford avenue, where it is said properties for a station have already been secured.

Phillips & Rangeley.—An increase of the capital stock by $100,000 was authorized at the recent stockholders' meeting, and the directors have applied to the Railroad Commissioners of Maine for authority to issue the new shares.

Reading, Lancaster & Baltimore.—A charter for this company was granted at Harrisburg, Pa., last week. The road is projected to extend from Reading to New Holland, Lancaster County, thence to a point on the Maryland state line in Fulton Township, Lancaster County, to connect with a railroad to be constructed from Perryville, Md., with a branch from Strasburg to Lancaster City, the entire length being 52 miles. The capital stock is $2,500,000. H. C. Lehman, of Philadelphia, is President.

Richmond & Danville.—The branch of the North Carolina Midland Railroad between Winston and Mocksville, N. C., is now completed. The last rail was laid last week, and a train will be run through to Mocksville, Nov. 1. The extension is 27 miles long.

Roanoke & Southern.—The tracklaying south of Roanoke, Va., will be resumed in a few days as soon as the bridge over Rock Creek is finished. The track has been laid for over 15 miles south of Roanoke and for a considerable distance north of Martinsville. The company will probably have trains running between these points in 60 days.

Roxborough.—The plans of the proposed Roxborough road, an extension of the Pennsylvania lines from Chelton avenue, Germantown, to the Montgomery county line above Roxborough, was approved by the Survey Committee of City Councils of Philadelphia last week. No level crossings are to be built, all the street crossings being above or under the grade, the expense of changing the grades of streets and roads being borne by the company. Bridges to be built in the future for streets not now opened or dedicated will be at the joint expense of the city and railroad company. The general route to be followed by the proposed road is along the west bank of the Wissahickon Creek, about midway between the ravine and Ridge avenue, to the county line. It will throw open to suburban settlement a region not now occupied by a steam railroad.

Savannah, Americus & Montgomery.—The bridge over the Chattahoochie River on the Montgomery extension has been finally completed, and the track will soon be laid over the bridge from Omaha on the east side of the river. There are several trestles and cuts on the west side of the river which have not yet been completed, but will now be soon finished. Only six more miles of track is to be laid on the Montgomery extension, and there will be no other delay in the work. Trains will probably be running over the entire extension, which is 95 miles long.

Sioux City, O'Neill & Western.—The committee which recently purchased the Pacific Short Line at foreclosure sale under the decree of the United States Circuit Court has organized this company. The capital stock is $3,800,000. The eastern terminus of the road is at Covington, Dakota County, Neb., and the western terminus at O'Neill, in Holt County. It extends through the counties of Dakota, Dixon, Cedar, Wayne, Pierce, Antelope and Hall.

Washington Southern.—Allen C. Mason, of Tacoma, who purchased the Mason County Central Railroad last summer, has a party of engineers surveying for a new railroad line from a point near Shelton, Wash., on the line of the above road, to connect that road with the Gray's Harbor branch of the Northern Pacific near Kamilchie, Wash. The proposed new line will extend southward about 10 miles, passing Isabella Lake, and will place Shelton 13 miles from the Puget Sound and Gray's Harbor line. The extension will be 10 or 11 miles in length, and will form the connecting link between Gray's Harbor and Puget Sound at Shelton.

Western New York & Pennsylvania.—The prospects for the early construction of the Oil City extension seem to be favorable and all locating surveys have been made. President Allen, in the annual report just published, says: "It is proposed to build a road from Oil City to near Turner's Station on the Stoneborough & New Castle Division, a distance of about 43 miles, forming a continuous line from New Castle to Oil City, thence by way of Olean to Rochester and to Buffalo, and also from Oil City via Mayville to Buffalo, making connections with trunk lines in New York and Pennsylvania."

GENERAL RAILROAD NEWS.

Canadian Pacific.—The earnings of the company for September, 1891, are as follows: Gross earnings, $1,835,658; operating expenses, $1,010,418; net profits, $825,240. In September, 1890, the net profits were $712,052, and the nine months ending Sept. 30, 1891, the figures are as follows: Gross earnings, $14,282,700; operating expenses, $9,119,913; net profits, $5,162,787. For the nine months ending Sept. 30, 1890, the net profits were $4,253,364.

Atchison, Topeka & Santa Fe.—The following table shows the gross earnings, operating expenses (exclusive of taxes and rentals), and net earnings of the system and its auxiliary lines for September, 1891:

	Gross earn.	Oper. exp.	Net earn.	Op. mile.
Roads owned and controlled	$1,276,803	$2,000,478	$1,276,325	6,536
Roads jointly owned	152,556	130,254	22,302	587
Total, Atchison system	$3,429,359	$2,130,732	$1,298,627	7,123
St Louis & San Francisco:				
Roads owned and controlled	$690,445	$341,891	$348,554	1,329
Roads jointly owned	118,954	124,555	24,399	536
Total, 'Frisco system	$879,399	$466,446	$372,953	1,865
Aggregate, both systems	$4,268,758	$2,597,178	$1,671,580	8,988

The comparative statement of all lines is as follows:

	Gross earn.	Net earn.	Per mile Gross earn.	Per mile Net earn.	Mileage.
Atchison system:					
Sept., 1891	$3 429,359	$1.298,627	$481.40	$182.30	7,124
Sept., 1890	3,137,549	1,035,675	441.33	145.68	7,109
Increase	291 810	262,952	40.07	36.62	15
'Frisco system:					
Sept., 1891	839,399	372,393	450.24	200.05	1,864
Sept., 1890	770,612	297,304	415.34	160.24	1,855
Increase	68,787	75,649	34.90	39.81	9
Aggregate general system:					
Sept., 1891	4,268,758	1,671,581	474.94	185 98	8.988
Sept., 1890	3,908,161	1,332.980	435,95	148.69	8,965
Increase	360,597	338,601	38.99	37.29	23

Chesapeake & Ohio.—The company reports gross earnings for September of $803,143, an increase of $88,888 as compared with the same month of last year, and net $211,306, an increase of $21,052. For the three months ending Sept. 30 the gross earnings were $2,409,081, an increase of $323,121 as compared with the corresponding period of last year, and net $670,236, an increase of $62,090.

Chicago, Burlington & Quincy.—The statement of earnings for September shows a gross increase of $468,698, which is partly accounted for in the large movement of corn to the East in that month. The figures are as follows:

	1891.	1890.		Inc. or dec.
Month of September:				
Gross earnings	$3,713.135	$3,244,467	I.	$468,698
Operating expenses	2,096,292	1 917,979	I.	178,312
Net earnings	$1,616,843	$1,326.488	I.	$290,356
Fixed charges	800,000	773,515	I.	26,484
Surplus	$816,843	$552,973	I.	$263,872
For nine months to Sept. 30:				
Gross earnings	$24.466,057	$25,919,120	D.	$1,513,063
Operating expenses	15,296 600	17,178,907	D.	1,882,307
Net earnings	$9,109 457	$8,740,213	I	$369,214
Fixed charges	7,152,000	6,961,640	I.	190,357
Surplus	$1,957.457	$1,778,573	I.	$178,885

Chicago, Milwaukee & St. Paul.—The company reports gross earnings for September of $3,093,609, an increase of $378,980 as compared with the same month of last year, and net earnings $1,329,876, an increase of $308,126. For the three months ending Sept. 30 the gross earnings were $7,770,167, an increase of $583,782 as compared with the corresponding period of last year, and net earnings $2,710,082, an increase of $269,724.

Chicago, Rock Island & Pacific.—The estimated gross earnings of the system, including the lines both east and west of the Missouri River, for the month of October, are $1,739,476, a decrease, as compared with the estimated earnings for the corresponding month of 1890, of $16,954.

Cleveland & Pittsburg.—A meeting of the stockholders will be held in Cleveland Nov. 18 to vote on the advisability of issuing general mortgage bonds for $10,000,000 to retire the present funded debt as it matures. The new bonds will bear interest at about 4 or 4½ per cent., while the present issues bear higher rates. About $1,100,000 of these will fall due in January next. The funded debt at present is about $4,800,000, and the balance of the new bonds will be held in reserve for future betterments and improvements. The Pennsylvania Company operates the Cleveland & Pittsburg under a 99 years' lease.

Houston Belt & Magnolia Park.—In the District Court at Houston, Tex., Nov. 4, on a petition of creditors, Judge Masterson appointed Captain James A. Baker, Jr., Receiver for the company and for the Port Houston Land & Improvement Co., with a bond of $60,000. This is the road built by the late Colonel John T. Brady, and the park property he designed to make a fine pleasure place. His death broke up the plans, and creditors compelled the court's action.

Missouri, Kansas & Texas.—The reorganization of the Texas lines and the numerous branches in the state, and the formation of a new company, amenable to the laws of Texas and having its headquarters in Austin, was accomplished last week and the charter filed. The capital stock is $8,000,000. The suits brought by the state against the company, and the roads controlled by it in the state, will be withdrawn. When the legislature met last winter legal proceedings were pending for a forfeiture of its charter by the state for alleged violation of the law such as the purchase of competing lines. To end the legal proceedings instituted by the state a compromise was reached by which the company agreed to end the federal receiverships, sell the various lines controlled by it within the state to a company formed for the purpose and accept a charter from the state. In pursuance of the agreement a special act was passed by the legislature authorizing the sale and chartering of the new company.

Northern Pacific.—The gross earnings of this road, exclusive of the Wisconsin Central, for September were $2,718,888, an increase of $210,666 as compared with the same month of last year, and net $1,178,588, an increase of $102,543.

Schuylkill River, East Side.—Suit was begun at Philadelphia last week by the Philadelphia & Reading against the Baltimore & Ohio, the Baltimore & Philadelphia Railroad and the Schuylkill River East Side Railroad, the latter being the title of the corporation under which the Baltimore & Ohio enters Philadelphia. A bill in equity was filed and it is understood that the proceeding is brought to force the Baltimore & Ohio to carry out one of the alleged financial contracts with the Reading. Seven or eight years ago the late Franklin B. Gowen perfected the organization of the Schuylkill East Side Co. and secured the charter for it. When the road was completed it was transferred to the Baltimore & Ohio under a traffic agreement, but with a stipulation that the latter company and the Reading should each be equally owners of the stock. It is now said that Reading's interest in this stock has never been delivered to it. The suit is said to be a friendly one.

Philadelphia & Reading Terminal.—It was announced last week that the $4,000,000 of bonds issued have been sold, and that none will be offered to the public at present. The bonds were sold privately at par. The mortgage provides for the issue of $8,500,000, but the remainder will only be sold as the company needs money. The syndicate believes that when more bonds are issued they can be sold at 105.

Western New York & Pennsylvania.—The gross earnings of the company for the year ending June 30 were $3,562,668—increase, $78,387; operating expenses, $2,485,782—increase, $156,807. Total net income, $1,080,960. Deducting taxes and interest on mortgages, bonds and notes the balance in net income is $448,185. Both road and rolling stock have been much improved during the last fiscal year, $226,718 having been expended in paying equipment notes and making payments on notes, while $231,529 was laid out in betterments and rolling stock.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Nov. 4, 1891.

There are numerous rumors afloat of coming demoralization in eastbound rates, but I am not inclined to believe that any of them will materialize, or that the situation is by any means as serious as some of the reporters profess to discover.

The rumors of the withdrawal of the Union Pacific, Denver & Rio Grande and Rio Grande Western from the Western Traffic Association which were current last week grew out of a meeting held at St. Louis, at which the Commissioners gave a hearing on the application of some of the Colorado-Utah lines to withdraw certain traffic from the direct control of the Association. This traffic has always been managed by the local associations composed of the roads in interest, and the only object sought to be attained is the harmonious working of the different associations.

The special committee of the Western Passenger Association appointed to prepare a report upon the advisability of establishing a rate bureau under the jurisdiction of the Association has reported in favor of the plan and advising its establishment on Jan. 1 next, to be in charge of two compilers under the direct supervision of the Association. It is recommended that as fast as new sheets are ready the existing sheets be withdrawn. Several reforms in the manner of issuing rate sheets are suggested and the committee thinks the change can be profitably made without confusion or detriment to any of the lines.

Traffic Notes.

The Canadian Pacific is taking from 150 to 200 cars of wheat eastward from Winnipeg daily.

About 650 car-loads of raisins have been sent east from California this season, and shipments are now averaging 20 cars a day.

A Halifax dispatch states that a good deal of flour is carried from Ontario to Nova Scotia via Boston, and that sugar from Halifax to Canadian points west of Montreal goes the same way.

Committees of the Trunk Line, Central Traffic, Southern Railway and Steamship and Coastwise Steamship associations, together with the New England roads, have adopted a uniform export bill of lading.

President Clark, of the Mobile & Ohio, has been authorized to arrange for the absorption of the Southeastern Mississippi Valley Railway Association by the Southern Railway and Steamship Association.

The Jacksonville, Tampa & Key West, and the Jacksonville, St. Augustine & Halifax River railroads have offered a series of prizes, consisting of 40 to 160 acres of land, to the Northern agents selling the most tickets over their lines during the winter months.

The Executive Committee of the California Traffic Association has elected F. L. Castle First Vice-President, Barry Baldwin Second Vice-President and Isaac Upham Treasurer. J. B. Stetson, President of the Association, is also President of the Executive Committee.

A Chicago dispatch states that the Louisville & Nashville has sent a circular to all ticket agents in the United States, giving notice that it will pay commissions: Cincinnati or Louisville to Memphis, $1.50 first class, and $1 second class; Cincinnati, Louisville or Evansville to Mobile and New Orleans, $2 and $1.50.

The Kansas City, Fort Scott & Memphis has shortened the time between Atlanta, Birmingham and points west, via Memphis, by about 12 hours. One passenger train in either direction is run through solid between Kansas City and Birmingham, with a buffet sleeping car between Kansas City and Atlanta.

The Railroad Commissioners of North Carolina have decided, in the case of the Atlantic Express Company against the Wilmington & Weldon and the Richmond & Danville roads that the contract under which these roads give exclusive privileges to the Southern Express Company is illegal and void. The commissioners order that the roads give the complainant equal rates and facilities.

In the first of two cases of the State of Oregon against E. P. Rogers, Assistant General Freight and Passenger Agent of the Southern Pacific Company, for discriminating in freight rates, a jury at Albany, Or., last week returned a verdict of guilty. Counsel for defendant filed a motion for a new trial, which was overruled. The court imposed a fine of $1,000. The case will be appealed to the Supreme Court.

A press dispatch from St. Louis states that the Special Agent of the Interstate Commerce Commission has secured indictments for paying illegal rebates against the following men: M. Knight, General Wabash; S. B. Knight, Wabash; A. Fell, Delaware, Lackawanna & Western; A. S. Crane, Fitchburg; G. B. Spriggs, New York, Chicago & St. Louis; and P. H. Wyckoff, Central of New Jersey. The agent, Mr. Kretschmar, was unsuccessful in securing indictments against any shippers who are charged with having received rebates. It is understood that Armour & Co. and Swift & Co., of Chicago, are the men to whom rebates were alleged to have been paid.

Inter-State Commerce Commission.

The commission has filed a petition in the United States Court at Grand Rapids against the Detroit, Grand Haven & Milwaukee to obtain an injunction restraining the defendant from furnishing free cartage to the business places of consignees. Stone & Carter, of Ionia, complained of discrimination in 1888, and May 12, 1890, the commission issued an order requiring the company to cease the practice within 30 days, but the road has disregarded the order.

DECISIONS ON VARIOUS POINTS.

The Commission on Oct. 30 announced its decision in the case of the Railroad Commission of Florida against the Savannah, Florida & Western and other lines forming all rail and part rail and part water routes from Florida to New York and other northern markets. The case involves the reasonableness of rates on oranges, and the main points decided are as follows:

The repeal of the law creating the Florida Railroad Commission could not operate as a withdrawal or dismissal of the complaint, that Commission having been only an instrument for the transmission of its complaint to this Commission and having fully performed that function before it ceased to exist. The act to regulate commerce makes it the duty of the Inter-State Commerce Commission to investigate any complaint so forwarded. It also authorizes it to institute any inquiry on its motion in the same manner and to the same effect as though complaint had been made, so that neither complaint nor complainant are necessary to confer jurisdiction.

The Clyde and Mallory steamship lines and the Florida Central Railroad Co., a railroad wholly in Florida, are engaged in interstate commerce as alleged in the complaint, and as such are subject to the jurisdiction of the Commission. The advance of 10 cents a box in orange rates made Nov. 23, 1890, was without justification and unreasonable to the extent of five cents a box, and defendants are required to reduce it accordingly and to make reparation to the persons entitled thereto. The proceeding is continued for the purpose of determining the amounts due such persons.

It will be noted that this is the first case where the Commission has ordered restitution to be made. All of the previous decisions of the Commission have been confined to requiring carriers to cease and desist from unlawful practices. The circumstances leading to the change in the policy of the Commission in the matter of ordering overcharges refunded, are detailed by the Washington correspondent of the Boston *Herald* as follows:

"The original act to regulate commerce provided that the Commission might order reparation, as well as fix rates, but when the commissioners examined the act they doubted their power to enforce such an order without a change in the law. In the language of the first annual report, the Commission, when such complaints have been brought to a hearing, has not discovered in the statute a purpose to confer upon it the general power to award damages in the cases of which it may take cognizance. The failure to provide in terms for a judgment and execution is strong negative testimony against such a purpose. Moreover, the act must be so construed as to harmonize with the seventh amendment to the federal constitution, which preserves the right of trial by jury in common lawsuits. The law was altered, as regards this point, by the act of March 2, 1890, but the Commission continued to discourage proceedings for reparation before it, for the reason that they were likely to be carried to the courts, and a decision by the Commission was little more than a duplication of labor.

"Recently, however, it has been intimated from the bench that a suit for reparation could not be brought in the courts if the suitor had already carried his complaint to the Interstate Commerce Commission. Section 9 of the Interstate Commerce Act provides that a person claiming to be damaged 'shall not have the right to pursue both of said remedies, and must in each case elect which of the two methods of procedure herein provided for he or they will adopt.'

The commissioners had been led to fear that the courts would treat complaints referring to the same subject matter as identical, even though they were brought before the Commission for a change in practice with reparation, and before the courts for reparation only. If the commissioners under these circumstances should refuse to make an order for reparation the complainant would be without remedy. They decided, therefore, that in such cases they ought to make an order for reparation, if the complainant was entitled to it. Hence the present decision.

"'The Commission still adheres to its preference that cases involving reparation, many of which do not involve the fixing of rates, should be brought in the courts to avoid needless labor, but where the fixing of rates belongs more properly to the Commission it will in future direct reparation where it seems proper. It will remain with the courts to enforce such decisions by the usual machinery if the railroads refuse to carry out the suggestion of the Commission.

"It is no new thing for the railroads to grant reparation upon the suggestion of the Commission, but it has always been done heretofore as the result of correspondence and not in obedience to a formal decision."

Eastbound Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending Oct. 31 amounted to 59,701 tons, against 57,737 tons during the preceding week, an increase of 1,964 tons, and against 69,353 tons during the corresponding week of 1890, a decrease of 9,652 tons. This includes flour, grain, seeds, provisions, dressed beef, hides, wool and lumber. The Lake lines carried 67,598 tons against 65,243 tons during the preceding week, a decrease of 2,355 tons. The proportions carried by each road were:

	Wk. to Oct. 31.		Wk. to Oct. 24.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	7,241	12.1	7,945	13.6
Wabash	4,476	7.5	4,116	7.2
Lake Shore & Michigan South.	8,974	15.0	8,168	14.2
Pitts., Ft. Wayne & Chicago	8,021	13.5	8,818	15.4
Pitts., Cin., Chicago & St. L	7,952	13.5	8,428	14 6
Baltimore & Ohio	3,944	6.6	3,861	6.4
Chicago & Grand Trunk	4,909	8.2	3,896	6.8
New York, Chic. & St. Louis	7,454	12.5	6,366	11.0
Chicago & Erie	6,730	11.3	6,209	10.8
Total	59,701	100.0	57,737	100.0

Of the above shipments 2,298 tons were flour, 22,215 tons grain, 2,193 tons millstuff, 4,237 tons cured meats, 8,933 tons dressed beef, 2,283 tons hides and 4,596 tons lumber. The three Vanderbilt lines carried 39.6 per cent. of all the business, while the two Pennsylvania lines carried but 26.8 per cent.